C2, FM 5-71-2 (Digital)

Change 2

Headquarters
Department of the Army
Washington, DC, July 2000

Armored Task-Force Engineer Combat Operations

1. Change FM 5-71-2, 28 June 1996, as follows:

Remove Old Pages	Insert New Pages
i through vii	i through vii
1-3 through 1-8	1-3, 1-3a, 1-3b, and 1-4 through 1-8
2-1 and 2-2	2-1 and 2-2
2-5 through 2-10	2-5 through 2-9, 2-9a, 2-9b, and 2-10
2-15 and 2-16	2-15, 2-16, 2-16a, and 2-16b
3-1 through 3-10	3-1, 3-2, 3-2a, 3-2b, 3-3 through 3-8, 3-8a, 3-8b, 3-9, 3-10, 3-10a, and 3-10b
3-13 and 3-14	3-13 and 3-14
4-1 through 4-10	4-1, 4-2, 4-2a, 4-2b, 4-3 through 4-8, 4-8a, 4-8b, 4-9, and 4-10
4-15 through 4-18	4-15, 4-15a, 4-15b, 4-16 through 4-18, 4-18a, and 4-18b
5-1 through 5-4	5-1 through 5-4, 5-4a, and 5-4b
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A-15 and A-16	A-15 through A-17
D-1 and D-2	D-1 and D-2
E-1 and E-2	E-1, E-1a, E-1b, and E-2
	G1 through G-4
Glossary-1 through Glossary-8	Glossary-1 through Glossary-12
Reference-1 and Reference-2	Reference-1 and Reference-2
Index-1 through Index-3	Index-1 through Index-3

2. A bar (▌) marks new or changed material.

3. File this transmittal sheet in front of the publication.

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FIELD MANUAL
NO. 5-71-2

HEADQUARTERS
DEPARTMENT OF THE ARMY
Washington, DC,

Armored Task-Force Engineer Combat Operations (Digital - Coordinating Draft)

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PREFACE

Field Manual (FM) 5-71-2 describes how the mechanized division engineer company supports a mechanized-infantry or armored battalion task force (TF). It is designed as an engineer extension to FM 71-2. This manual serves as a guide for both TF engineers and subordinate leaders in planning, integrating, and conducting engineer operations. It also serves as a guide for the TF staff and subordinate maneuver commanders on the organization, capabilities, and employment of TF engineers.

This manual sets forth the principles of conducting engineer operations supporting an armored TF. It addresses engineer tactics, techniques, and procedures (TTP) that highlight critical principles. However, the TTP are intended to be descriptive rather than prescriptive; they are not a replacement for the TTP and standing operating procedures (SOPs) that are unique to the supported unit. This publication is also designed to be used by corps combat, separate, and armored cavalry mechanized combat-engineer companies.

FM 5-71-2 is fully compatible with Army doctrine as contained in FM 100-5 and is consistent with other combined-arms doctrine. This is not a stand-alone manual. The user must have a fundamental understanding of the concepts outlined in FMs 100-5, 100-7, 100-16, 71-1, 71-2, 5-71-100, 5-100, 101-5, and 101-5-1. This manual also implements Standardization Agreements (STANAGs) 2394 and 2868.

Change 2 addresses engineer tactical operations conducted in a Force XXI (FXXI) environment. It serves as a guide for the use of digital command, control, communications, computers, and intelligence (C4I) systems to plan, integrate actions/activities, and conduct engineer operations. In particular, it addresses the capabilities and employment of new or emerging FXXI systems and TTP that enhance engineer operations and contribute to the lethality of the digitally-equipped TF. Appendix C, FM 5-71-3 discusses engineer-unique digital systems. The TTP discussed in this manual should augment rather than replace the TTP and SOPs unique to the supported unit.

NOTE: Change 2 does not address light infantry operations since much of the doctrine and TTP associated with the fielding and use of digital systems by these units has yet to be tested and validated.

The proponent of this publication is Headquarters (HQ), United States Army Engineer School (USAES). Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, USAES, ATTN: ATSE-TD-D, Fort Leonard Wood, Missouri 65473-6650.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

lead time for successful integration with the rest of the force. Engineers carefully plan their activities to ensure that the effect occurs at the decisive point and time. Engineer units also ensure that their elements are working toward the same purpose as the rest of the force. Engineers must ensure that their actions work in concert with other battlefield operating systems (BOSs) to maximize their synergistic effect.

Versatility

Versatility is the unit's ability to meet diverse mission requirements. Commanders shift focus, tailor forces, and move from one role or mission to another rapidly and efficiently. Versatility implies a capacity to be multifunctional; to operate across regions throughout the full spectrum of military operations; and to perform at the tactical, operational, and strategic levels. Engineer forces possess the ability and are ideally suited to perform in many roles and environments during war and contingency operations. They incorporate into their organizations the ability to conduct smooth transitions from one mission to another. Versatility within the engineer force is the result of well-trained and -equipped units, high standards, and detailed planning.

This versatility is further complemented by the introduction of digital systems, such as the Force XXI Battle Command-Brigade and Below (FBCB2), that facilitate distributed operations across the battlefield.

BATTLEFIELD ORGANIZATION

Modern battles involve close, deep, and rear operations that require continuous effort and attention. Engineer companies fight and operate on a linear or nonlinear (no front lines) battlefield. They are positioned throughout the corps's area of operations (AO) to support the overall battle.

Close operations consist of actions that support the current fight against enemy forces in contact. In close operations, engineer companies fight as an integrated part of a committed maneuver unit or in support of it. They may also fight as part of the engineer battalions/TFs.

Deep operations consist of actions directed against enemy forces not in contact. They are used to simultaneously attack the enemy through the depth of the commander's battle space. Engineer units participate in deep operations in several ways. They may provide terrain analysis to maneuver commanders and may assist in target analysis and nomination. They may also provide advice on using remotely delivered situational obstacles in the enemy's rear area or using engineer reconnaissance teams forward for placement of situational obstacles. Engineer units may also open and maintain necessary routes and aviation facilities and participate in raids whenever ground forces conduct deep operations.

Rear operations are actions to the rear of elements in contact. These actions assure freedom of maneuver and continuity of operations. Engineer units provide extensive support to rear operations. Mobility in the form of route repair and survivability in the form of hardened shelters, protective obstacles, and camouflage measures are typical missions.

FXXI operations are characterized by individual units conducting nonlinear, dispersed, and simultaneous operations throughout an expanded battle space. Army operations doctrine envisions battles fought over wide areas, up to 400 kilometers (km) (249 miles) deep. Distributed operations empower subordinates to operate independently within the commander's intent, leading to synergistic effects that exceed the effects of a centralized headquarters. The battles will be fought at a faster pace and with increasingly sophisticated weapons. The battlefield may be nonlinear, asymmetrical, or noncontiguous with boundaries changing dramatically. These distributed operations require that the engineers maintain a greater degree of situational awareness (SA). This places a significant burden on the TF to anticipate

future support requirements and tasks that will be used to shape the company's battle space. The extended battle space will require the engineer companies to provide extensive mobility support. Under this concept, the brigade may replace the division as the major tactical element on the battlefield. Corps commanders may task-organize brigades into divisions to accomplish each mission.

The effect of future Army operations on engineer units is significant. Engineer support to combat operations will be based on habitual relationships. Engineer battalions will support maneuver brigades while engineer companies will support battalions/TFs. Also, the engineer company could fight directly for the engineer battalion/TF. Tactical operations will rely heavily on the use of counterattacks to defeat the enemy. This will require engineer companies to provide extensive mobility support.

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TASK-FORCE ORGANIZATION AND FUNCTIONS

The battalion/TF is the lowest echelon at which firepower, maneuver, intelligence, and other combined-arms support are combined under a single commander. Mechanized-infantry and tank battalions are organized, equipped, and trained to accomplish compatible missions based on the respective battalion's unique capabilities and limitations.

The tank and mechanized-infantry battalions' capabilities are increased through task organization. Based on his estimate of the situation, the maneuver brigade commander task-organizes tank and mechanized-infantry battalions by cross attaching companies between units. The brigade commander determines the mix of companies in the TF. Similarly, the TF commander's estimate may require cross attaching platoons to form one or more companies/teams for specific missions.

The TF is formed by placing pure (not task-organized) tank and mechanized-infantry companies under the command of a battalion headquarters. Combat support (CS) and combat service support (CSS) elements within the brigade perform mission analysis and are integrated into the TF structure based on the higher commander's estimate of the mission and the assets required to accomplish the specific mission. This provides a versatile force mix, increasing the options available to the force commander (see Figure 1-1).

TASK-FORCE COMMANDER

The TF's fighting characteristics are set by the TF commander's tactical and technical

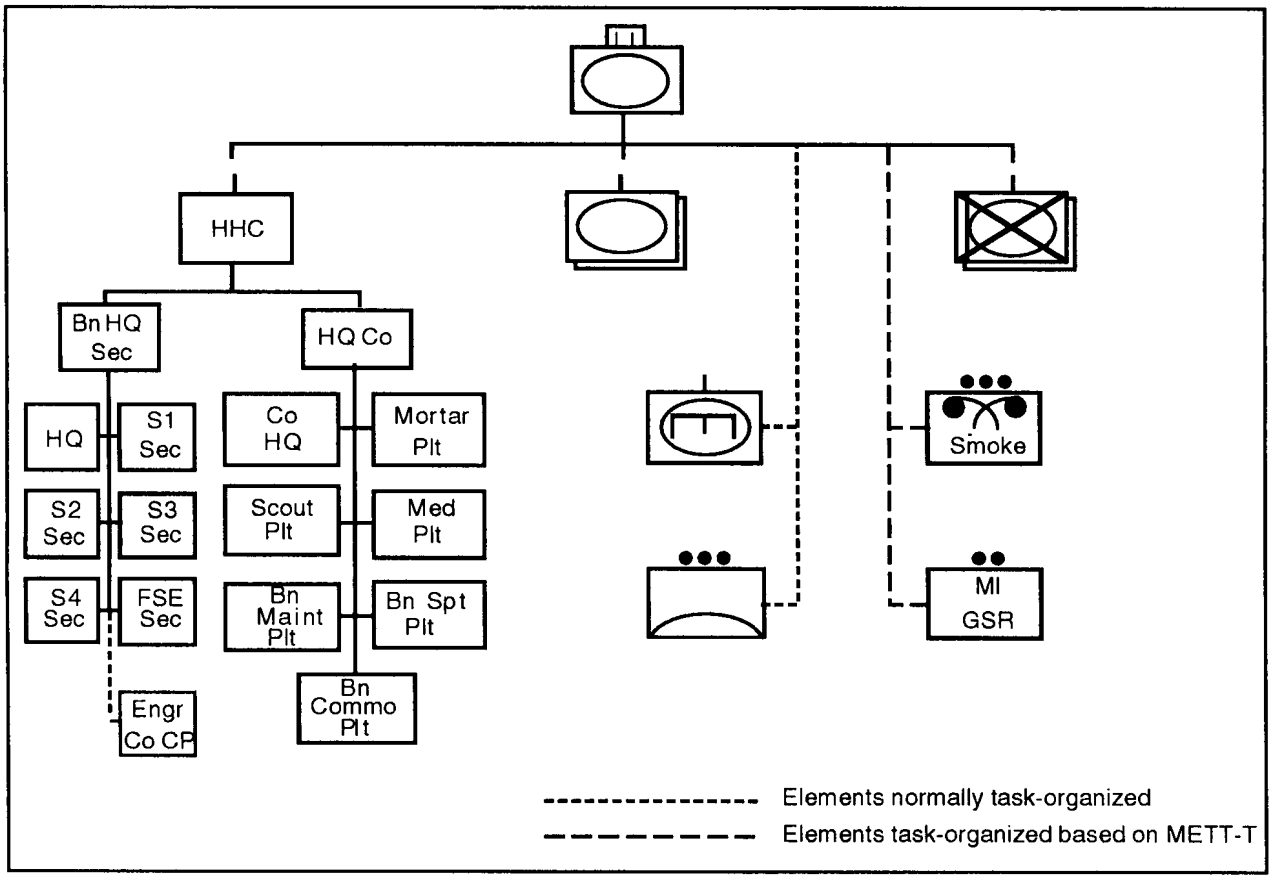


Figure 1-1. Armored TF (balanced)

leadership skills. He develops the TF combat team by organizing his assets based on mission, enemy, terrain, troops, and time available (METT-T).

TASK-FORCE STAFF

The TF is the lowest tactical echelon with a staff. The TF staff is organized specifically to be a single, cohesive unit to assist the commander in accomplishing the mission. The TF executive officer (XO) is the principal assistant to the TF commander. The TF XO is the TF's "chief of staff" and is second in command (2IC). He is the principal integrator of the coordinating and special staffs, and his main emphasis is on CSS operations in support of the TF maneuver plans. The TF staff consists of the organic coordinating staff officers from the base unit of which the TF was formed. They include the—

- Adjutant (US Army) (S1).
- Intelligence Officer (US Army) (S2).
- Operations and Training Officer (US Army) (S3).
- Supply Officer (US Army) (S4).
- Battalion maintenance officer (BMO).

The TF also has special staff officers (organic, assigned, or attached) who represent special areas of expertise. These officers, who normally advise the TF commander during combat operations, include the—

- S3 air officer.
- Chemical officer.
- Tactical intelligence officer.
- Liaison officer (LO).
- Battalion signal officer (BSO).
- Battalion surgeon.
- Battalion chaplain.
- TF engineer.
- Fire-support officer (FSO).
- Air-defense artillery officer (ADO).
- Air liaison officer/forward air controller (FAC).

The special staff represents the subject-matter expertise of the TF staff in their particular BOS.

Senior leaders of critical elements supporting the TF provide special staff assistance to the commander directly or through the primary staff. These leaders provide the commander with information on integrating their assets into the TF combat team. They are the special staff representatives for specific BOSs. These senior leaders include the following:

TF Engineer

The TF engineer is the senior leader of the supporting engineer unit. He advises the commander on the employment of engineer assets. He is normally the engineer company commander.

FSO

The FSO is a habitually associated special staff officer from the field artillery (FA) battalion in direct support (DS) of the brigade. He coordinates all fire support for TF operations and establishes the fire-support element (FSE) at the TF's main command post (CP). The FSO normally operates forward with the TF commander. The FSO coordinates for indirect-fire coverage of obstacles and breaching. He is also a key planner for artillery-delivered family of scatterable mines (FASCAM).

ADO

The ADO is the senior leader of the supporting air-defense artillery (ADA) unit. He advises the TF commander on the employment of ADA assets.

Air Liaison Officer/FAC

The FAC is a United States Air Force (USAF) officer responsible for coordinating and employing USAF assets in support of the TF. The FAC is responsible for the tactical air-control party (TACP). He primarily operates forward with the TF commander.

Further detailed descriptions of the special staff's respective functions can be found in FMs 71-2 and 101-5.

ENGINEER COMPANY ORGANIZATION

The engineer company is the lowest engineer echelon that can plan and execute continuous 24-hour operations in support of the maneuver force. The engineer company is ideally suited for integration into maneuver TF operations. It is an agile organization that assures the freedom to maneuver on the battlefield within the combined-arms-team framework. Its structure and operational characteristics enhance force momentum and lethality and increase the synchronization of engineer actions within the TF's battle space.

The engineer company frequently fights as part of the engineer battalion/TF. The company retains its normal mission of assuring mobility. However, the commander does not have a special staff responsibility relationship with the engineer battalion commander. When fighting with the engineer battalion, the company commander enjoys a role similar to that of his armor and mechanized-infantry peers in TF organizations.

MISSION

The engineer company's mission is to increase the combat effectiveness of the maneuver TF by accomplishing mobility, countermobility, and survivability tasks. Engineers supporting the TF are critical combat multipliers, preserving the freedom of maneuver, enhancing the TF's firepower, and protecting the force from enemy weapons effects. The FXXI engineer company can provide limited countermobility and survivability support to the TF. The company requires corps augmentation to support additional TF countermobility and survivability requirements (see Figure 1-2, page 1-8).

ORGANIZATION

The division engineer company consists of a company headquarters, two combat-engineer platoons, and an assault and obstacle (A&O) platoon (see Figure 1-3, page 1-8). The company can be organized to operate as an engineer pure element, or it can receive cross-attached tank or infantry platoons. The company headquarters includes the commander; the operations officer (also known as the XO); the first sergeant (1SG); the operations noncommissioned officer (NCO); the supply sergeant; the nuclear, biological, and chemical (NBC) sergeant; and the communications specialist or NCO. The company headquarters commands and controls the unit's tactical employment and administrative operations.

Engineer Platoon

The engineer platoon is normally the lowest-level engineer unit that can effectively accomplish independent missions and tasks. It is a basic unit capable of maneuvering during combat operations, and it can fight as part of the engineer company or as part of the maneuver company/team.

The FXXI engineer platoon can expect to conduct rapid and frequent movement on the digitized battlefield due to increased operational tempos. The nature of digital operations is one of continuous transition between offensive and defensive activities aimed at overwhelming the enemy. During offensive operations, the primary mission of the platoon is to breach initial lanes through tactical obstacles. The ability to breach and bypass obstacles will be enhanced with the introduction of the Grizzly, the Wolverine, and digital information related to the positioning of obstacles through the FBCB2.

The engineer platoon consists of a platoon headquarters section and 2 engineer squads. The platoon leader, platoon sergeant (PSG), and 19 enlisted personnel are mounted in 4 engineer squad vehicles (ESVs) organized into 2 sections, with 2 ESVs in each section.

NOTE: Under consideration is the use of a Bradley engineer squad vehicle (BESV) augmented with specialized kits such as a surface blade, mine dispensers, and mine markers. The BESV would give the engineers mobility and survivability comparable to the maneuver force.

The platoon leader and PSG are the section leaders. The wingman concept facilitates command and control (C^2) of the other two ESVs carrying the two dismounted sapper squads. It prepares to fight both mounted and dismounted during various situations. The engineer platoon frequently receives augmentation in the form of special equipment from the A&O platoon.

Engineer squads can be task-organized for specific missions with limited duration such as engineer reconnaissance missions. Task-organizing below platoon level degrades the engineer platoon leader's ability to mass critical engineer assets during operations.

A&O Platoon

The A&O platoon is a unique element that contains specialized engineer heavy equipment to support mobility, countermobility, and survivability tasks undertaken by the company or platoons. The platoon consists of a platoon headquarters section, an assault section, and an obstacle section. The platoon leader, PSG, and 29 enlisted personnel will maneuver in 4 armored combat earthmover, M9 (ACE) vehicles, 4 Wolverines, 4 Grizzly vehicles, 2 M548 Volcano mine dispensers, 2 heavy expanded mobility tactical trucks (HEMTTs), and two high-mobility multipurpose wheeled vehicles (HMMWVs). The A&O platoon is not organized to operate independently like the other engineer platoons. It provides the company commander with specialized equipment to weight both offensive and defensive operations. Normally, the A&O platoon is responsible for reducing enemy complex obstacles, destroying trenches and bunkers, crossing gaps, fortifying construction, controlling specialized equipment control, and preparing flank (situational) obstacles. The platoon will normally operate—

- Supported by an engineer platoon.
- In task-organized sections in support of the engineer platoon or company.
- Task-organized to a maneuver company/team within the TF.

The assault sections are structured for mobility missions, focusing on reducing enemy complex obstacles and fortifications that inhibit friendly maneuver. Each assault section will contain Grizzly breachers that are capable of reducing a variety of natural and man-made obstacles such as minefields, gaps, and constructed berms. The section's activities are controlled by a section sergeant who maintains communications with the individual vehicles and the element that they are supporting.

The obstacle section is structured to focus on reinforcing terrain with obstacles to attack the enemy's ability to maneuver. The section also has the capability to perform survivability tasks to protect personnel and fighting vehicles and systems within the maneuver force. The section contains ACEs and multiple mine-delivery systems. Their activities are controlled by a section sergeant, using the same considerations as within the assault sections.

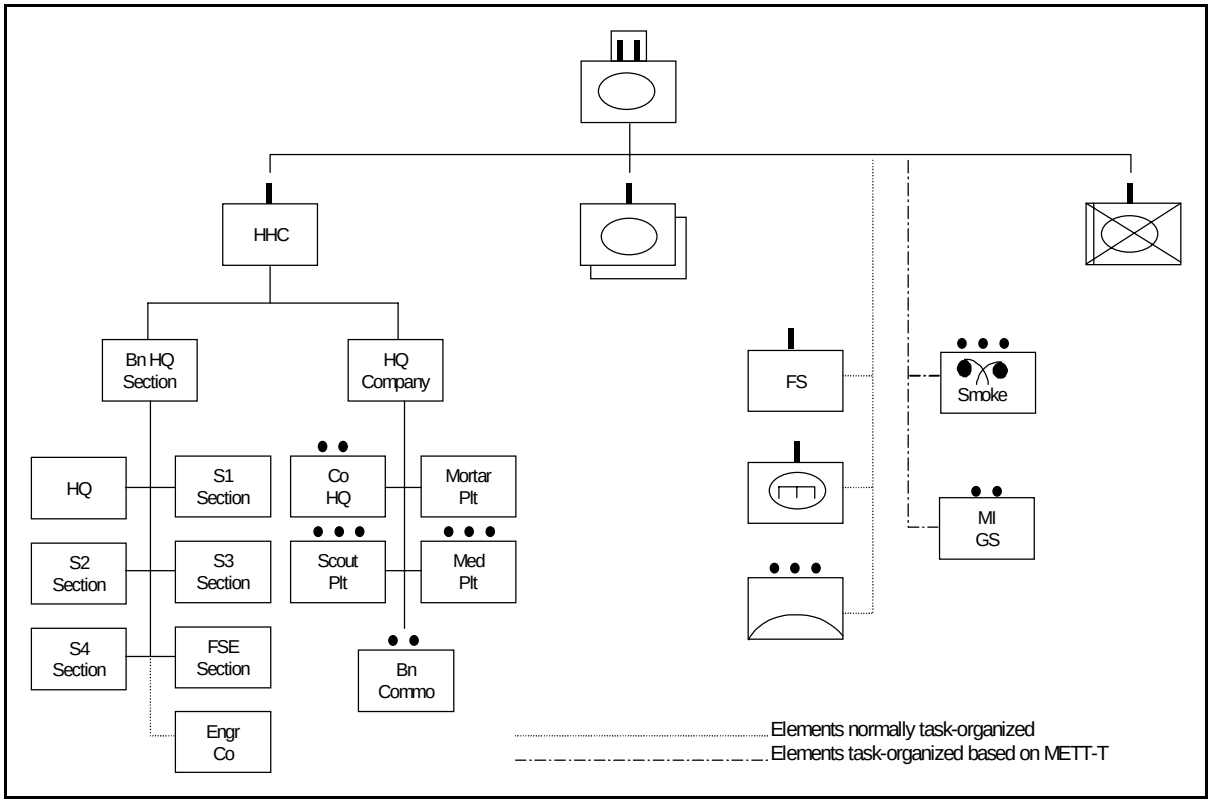


Figure 1-2. FXXI armored TF organization

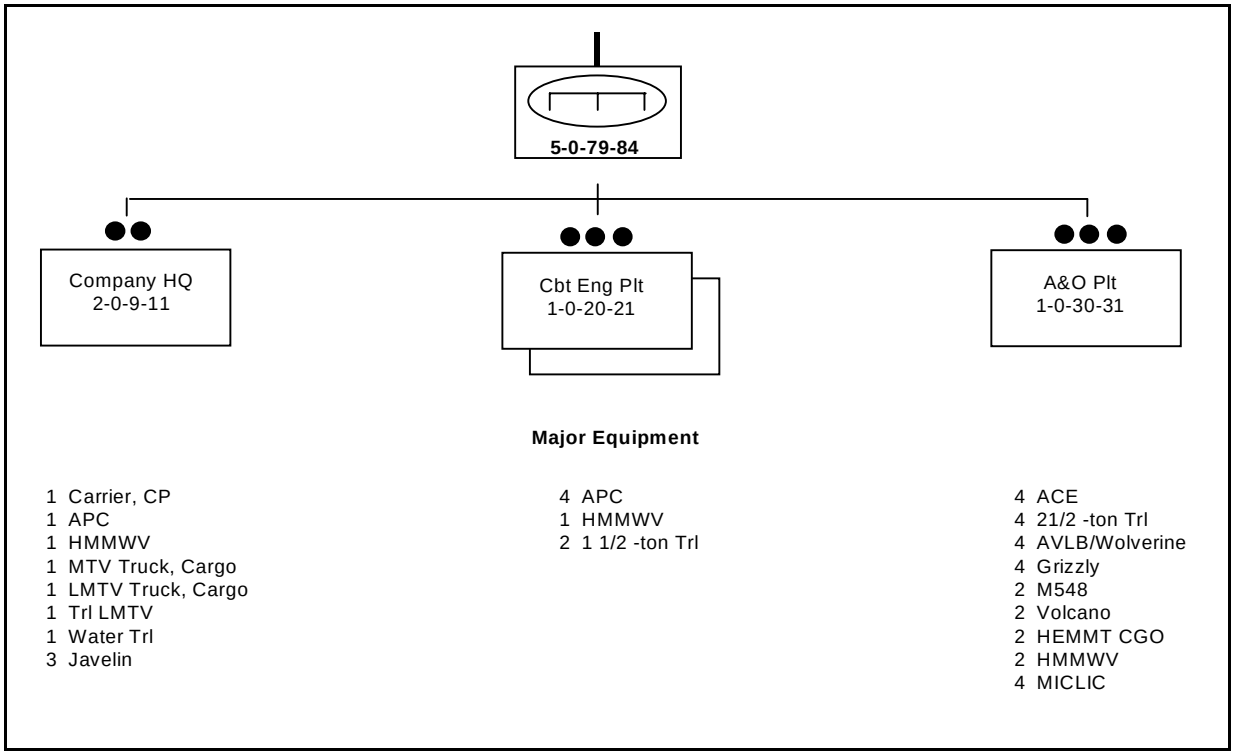


Figure 1-3. FXXI engineer company (mechanized) organization

CHAPTER 2

COMMAND AND CONTROL

A company commander uses the C^2 process to ensure that his company accomplishes its missions. The FXXI engineer commander has enhanced digital communication systems that increase SA and C^2 capabilities within the company, allowing him greater flexibility in leading, prioritizing, and allocating assets necessary to support the TF. This chapter provides the TTP needed to command and control the engineer company and to make sound tactical decisions.

COMMAND AND CONTROL RESPONSIBILITIES

A leader's fundamental responsibility is to understand both the boundaries and distances of C^2. He must provide the proper level of command while exercising the appropriate level of control to be effective. Both are critical to the engineer company's success.

COMMAND

Command is the art of military leadership. As part of commanding, leaders weigh the mission requirements and the soldiers' welfare. The company commander demonstrates concern for the soldiers' well-being and leads by example to inspire their confidence. A commander often delegates authority to subordinates. This reinforces and strengthens the chain of command. Responsibility, however, can never be delegated. When subordinates succeed, it is their success; when they fail, it is the commander's responsibility to accept that failure and to initiate corrective action.

CONTROL

Control is inherent in C^2. The commander uses control to monitor the company's status and to identify and correct deviations from set standards. The commander provides a means to measure, report, and correct performance. Control allows him the freedom to operate, to delegate authority, to lead from any critical point on the battlefield, and to synchronize actions across his AO.

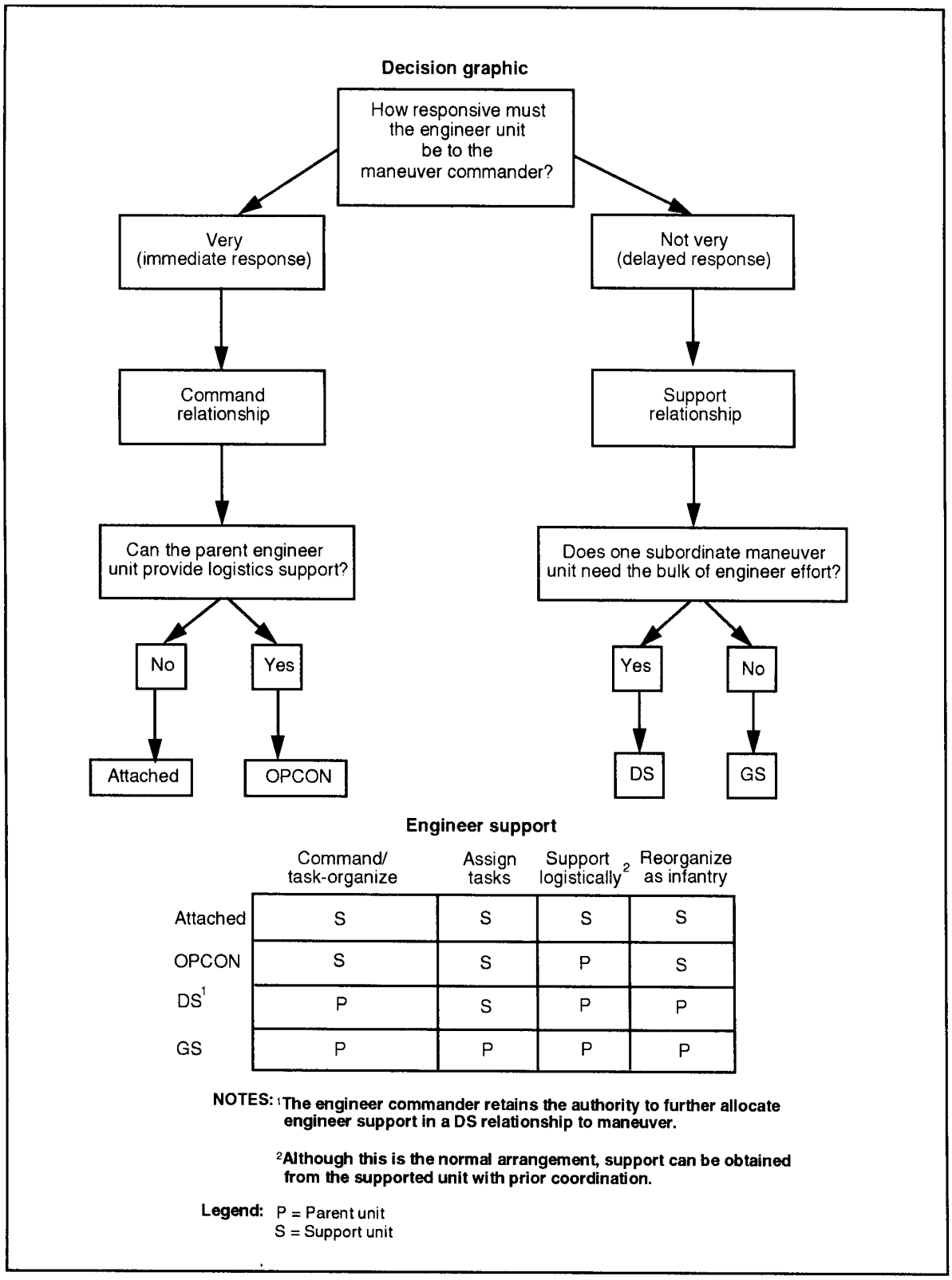
COMMAND/SUPPORT RELATIONSHIPS

Engineer companies are organic to engineer battalions (except numbered separate companies). The engineer company can be task-organized to support maneuver TFs, other engineer battalions, or cavalry squadrons based on mission requirements. However, these task organizations are relatively short in duration. The engineer company commander has the challenging task of keeping his parent engineer battalion apprised of his status regardless of the command/support relationship the company enjoys with another unit. This is a critical concept that facilitates future planning and the use of the engineer force in subsequent operations.

Engineer companies are frequently task-organized in a variety of ways, depending on the mission and its requirements. The command/support relationship with other units establishes the lines of authority and support. Figure 2-1, page 2-2, illustrates a decision graphic for command/support relationships. A company may be organized under any of the following relationships:

Attached

An attached relationship is the temporary placement of the company in an organization. The commander of the supported organization exercises the same degree of C^2 as he does over his organic units. When attached, the engineer company receives all



Engineer support

	Command/ task-organize	Assign tasks	Support logistically[2]	Reorganize as infantry
Attached	S	S	S	S
OPCON	S	S	P	S
DS[1]	P	S	P	P
GS	P	P	P	P

NOTES: [1]**The engineer commander retains the authority to further allocate engineer support in a DS relationship to maneuver.**

[2]**Although this is the normal arrangement, support can be obtained from the supported unit with prior coordination.**

Legend: P = Parent unit
S = Support unit

Figure 2-1. Decision graphic and engineer support

engineer company commander in his special staff-officer responsibilities and collocates the engineer CP with the TF tactical operations center (TOC) throughout the planning, preparation, and execution phases of the operation. The CP remains an integral part of the TOC for monitoring the engineer preparation and execution status during the operation. The XO is responsible for the initial development of the engineer battlefield assessment (EBA). He receives guidance and direction from the company commander and information from the TF and engineer battalion S3s and the assistant brigade engineer to assist him in this task. He also supervises the company headquarters section. The XO, along with the TF S2, develops the TF's situation template (SITEMP). The XO ensures that the terrain analysis and the analysis of the enemy's engineer capabilities are incorporated into the SITEMP. He analyzes the friendly engineer capability and assists the company commander in integrating engineers into the TF's scheme of maneuver and in developing the TF engineer annex and the company operation orders (OPORDs). The XO is the logistics planner for the engineers in the TF's sector.

The 1SG is the primary company logistics executor. He coordinates with either the TF or engineer battalion S4, the support platoon leader, the company supply sergeant, and the A&O platoon leader to ensure that the engineer company is logistically prepared for its next mission. He develops the company's CSS plan and ensures that it is integrated into the engineer battalion or TF CSS plan. He is the company commander's senior enlisted advisor, his primary agent for the welfare of the company's soldiers, and his quality-control agent. The 1SG is the driving force behind the company's prebattle preparation. He directly supervises the company's NCOs as they inspect their platoons before the company commander performs his precombat inspections. He is also the key coordinator for additional medical support and casualty evacuation (CASEVAC) for the company. Additionally, he orchestrates maintenance support as needed and ensures that maintenance is properly performed and reported.

The engineer platoon leader has dual responsibilities as both a platoon leader and as the senior engineer advisor to the maneuver company/team. He is the company/team commander's expert on mobility and countermobility.

The A&O platoon leader is the survivability expert in the engineer company. In the offense, he may lead the company's mobility reserve. He may also act as the company's maintenance officer to assist in this critical combat function.

The company operations NCO is critical to the company's ability to maintain 24-hours-per-day operations. He must be able to prepare the initial EBA in the XO's absence. He is pivotal to the company's ability to perform sustained planning.

The engineer company CP provides the TF's TOC with information about current engineer operations that are required for making timely decisions. The company CP should have the same C4I capabilities as the company commander, although the engineer company does not have an organic Maneuver Control System (MCS). At the FXXI company level, FBCB2 is the only Army Battle Command System (ABCS) available to interface digitally with the platoons, the supported TF, and the engineer battalion. The engineer company CP—

- Tracks friendly and enemy obstacles.
- Coordinates the execution of the scheme of engineer operations (SOEO) within the TF.
- Synchronizes the engineer effort among the maneuver companies/teams.
- Provides engineer expertise to the TF staff.
- Receives, posts, and analyzes combat information affecting current engineer operations and provides input to the TF intelligence preparation of the battlefield (IPB).

- Coordinates reports and information with the engineer battalion CP.
- Provides engineer expertise to the TF FSE.

ENGINEER TACTICAL PLANNING

Engineer tactical planning is an integral part of the TF's decision-making process. It is imperative that the engineer be fully integrated in TF planning and also an expert at engineer planning.

PLANNING AND DECISION MAKING

Commanders at all levels are responsible for planning tactical operations and making sound decisions. The tactical decision-making process, troop-leading procedures (TLPs), and the engineer-estimate process are all tools available for decision making. These processes are integrated and accomplished concurrently rather than sequentially. The engineer estimate and the TF and engineer company OPORDs are covered in greater detail in Appendixes A and B. The engineer estimate is prepared as part of the TF's tactical decision-making process and follows the basic format of the TLPs. The engineer company OPORD is based on the SOEO from the engineer estimate.

The engineer estimate is the primary tool that engineers use to facilitate planning in the TF. The estimate allows the TF engineer to integrate his company's capabilities as a combat multiplier into the TF's plan. The estimate allows the timely development of an SOEO and facilitates the early employment of engineers.

The tactical decision-making process provides the framework for focusing the TF staff as they develop the TF plan. The engineer estimate is an extension of the tactical decision-making process and is integral in developing a successful plan. Figure 2-2 illustrates the relationships between the engineer estimate, the tactical decision-making process, and the TLPs.

The TF plan dominates the development of the engineer estimate. The engineer must understand the TF plan in order to plan for engineer support properly. He must thoroughly understand the TF commander's intent and concept for maneuver, engineers, and fire support. The engineer estimate should be a continuous process, with each step or consideration refined based on changes in the current situation and any changes to future missions.

The engineer battalion is a principal provider of intent. The engineer battalion commander may also provide important information, intent, guidance, and direction to assist the company commander's development of his plan, regardless of the command/support relationship. The company commander should seek the brigade engineer's guidance whenever possible.

The TF engineer ensures that required engineer missions and instructions and constraints or limitations are included in the appropriate part of the TF OPORD. Information related to engineers is not solely compiled in an engineer annex. Doing so can obscure information that is critical to all elements of the TF. For example, the enemy's use of scatterable mines (SCATMINEs) during his preparatory fires should be included in the enemy situation subparagraph of the OPORD. Likewise, if Team A is required to breach two lanes to allow the TF to envelop the enemy, then this should be a task specified in the subunit instructions to Team A, not hidden in an engineer annex.

The SOEO is another example of engineer information contained in the base TF OPORD. It describes the general concept for how the engineer company will support the TF operation. The engineer-estimate process enables the TF engineer to identify critical engineer-specific information and mission-essential tasks for inclusion into the

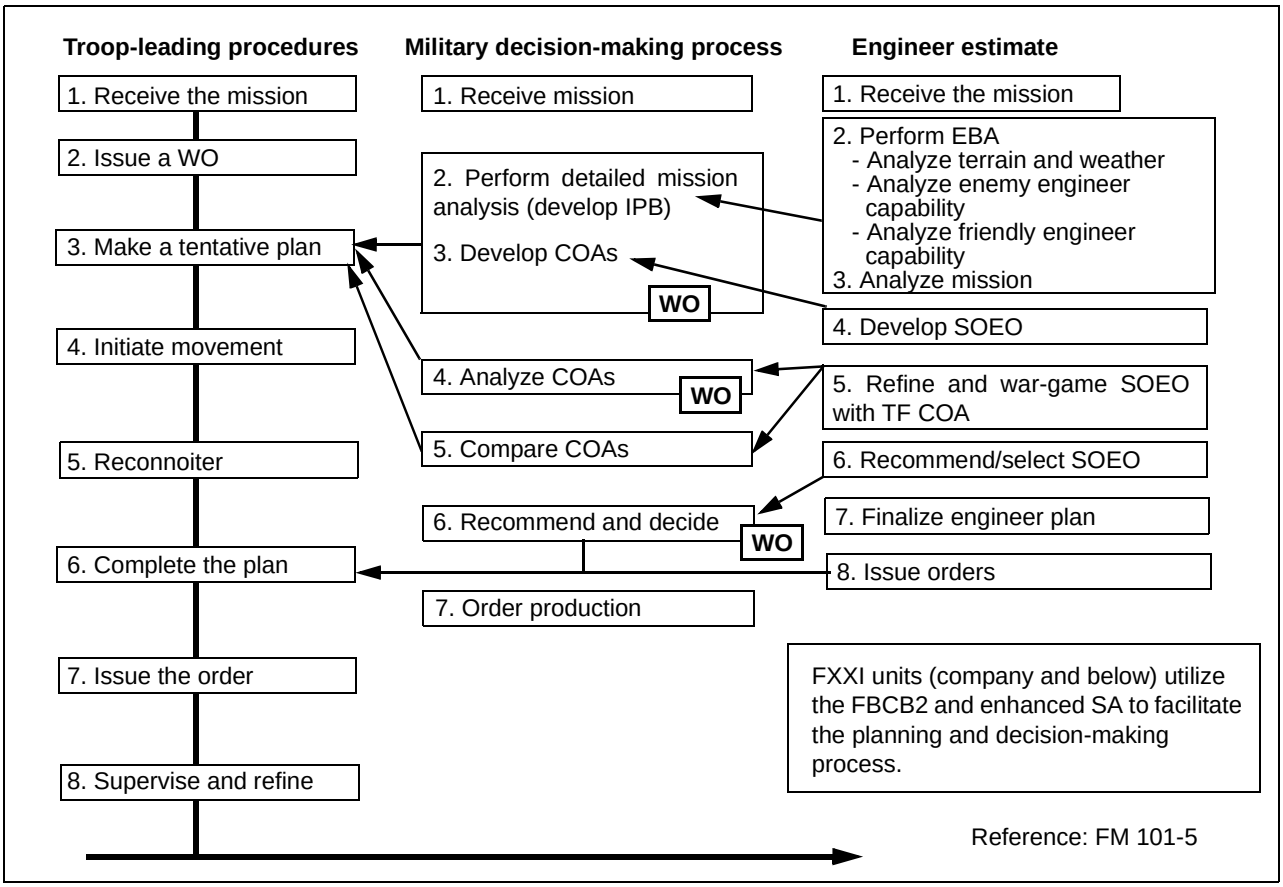


Figure 2-2. Relationship between TLPs, the tactical decision-making process, and the engineer estimate

base TF order. Table 2-2, page 2-8, illustrates how key components of the engineer-estimate process drive engineer input into the TF order. The FBCB2 significantly expands the C^2 capabilities of the FXXI commander and enables SA through digital linkage with the battalion. This digital linkage facilitates a continuous two-way flow of voice and digital message traffic that promotes the development of a relevant common picture (RCP) of the battlefield. This RCP is developed at higher headquarters on the MCS. When this information is analyzed and compared to the FBCB2 visual displays, the company commander is able to speed his tactical decision making.

FINALIZED ENGINEER PLAN

The SOEO is refined during war gaming as part of the TF's course of action (COA). The final SOEO is the basis for the engineer order.

ORDERS

Commanders issue timely, clear, and concise orders to give purpose and direction to their subordinates. The engineer company commander translates the TF's SOEO into clear, concise engineer missions. The company order combines the concept of engineer support for the TF with the engineer-company-specific plans required to accomplish specific engineer tasks identified during mission analysis. The engineer company order ensures unity of engineer effort.

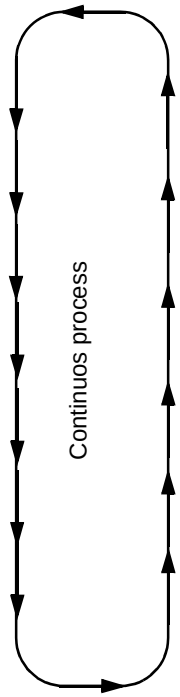
The engineer company commander uses the OPORD to command the engineers remaining under his control for the operation. The engineer company commander, as the TF engineer, uses the combination of the TF order and his company order to

exercise the appropriate level of C^2 of the engineers in the TF. The FBCB2 facilitates and speeds the planning and coordination process. For example, the FBCB2 allows the FXXI engineer company commander to digitally transmit orders, overlays, reports, and free-text messages received to all vehicles within the company and higher headquarters and to effect coordination with higher headquarters and flank units. The TLPs provide the format for developing the company order and supervising the engineer company's preparation for the operation.

TROOP-LEADING PROCEDURES

TLPs begin when the mission is received, and they end when the mission is completed. These procedures consist of a series of actions used for planning, coordinating, executing, and supervising tactical operations. The exact sequence and timing of each TLP depend on the time and information available to the leader. A warning order (WO) may be issued immediately

Table 2-2. Engineer estimate/input into the OPORD



Engineer Estimate	Input	OPORD Paragraph
Conduct IPB/EBA	Critical aspects of the terrain and enemy engineer activity that impact the TF plan	1.Situation a.Enemy Intelligence annex
Analyze the engineer mission	Mission-essential M/S tasks assigned to the TF or engineer company	3. Execution e.Subunit missions • Maneuver • Engineer
Develop the SOEO	Concept of engineer operations to support the TF Task organization of engineer forces and command/support relationships Allocation of M/S mission resources to companies/teams Graphic control measures needed for obstacle control or breaching	3. Execution d.SOEO Task organization 4. Service support Overlays: Operations Engineer CSS
War-game and refine the engineer plan	Additional coordinating instructions to companies/teams that are needed to synchronize the engineer effort	3. Execution f. Coordinating instructions
Recommend a COA	Finalize the SOEO	2. Mission 3. Execution d. SOEO

after the receipt of the mission or later as more information is available. Reconnaissance should be ongoing throughout the preparations, but should be completed before the order is issued. The following are the steps involved in TLPs:

1. Receive the mission.
2. Issue the WO.
3. Make a tentative plan.
    - Estimate the situation.
        — Analyze the mission in detail.
        — Analyze the terrain and enemy.
        — Develop a COA (plan).
        — Analyze the COA (war-game).
        — Make a decision.
    - Expand the COA into a tentative plan.
4. Initiate movement.
5. Reconnoiter.
6. Complete the order.
7. Issue the order.
8. Supervise the execution.
    - Rehearse.
    - Inspect.
    - Coordinate.

The FBCB2 does not replace TLPs, but streamlines the process through the simultaneous sharing of critical information with all company elements. FBCB2-equipped units can accelerate the TLPs by using the following techniques:

- Using the FBCB2 map screen to conduct a quick map reconnaissance of the terrain and enemy and analyzing the mission using the factors of METT-T.

  NOTE: An initial reconnaissance of the AO can be conducted with digital terrain products using Digital Topographic Support System (DTSS) information provided through the TF MCS. The DTSS can provide the engineer company commander focused terrain data and graphics.

- Preparing a company digitized operations overlay containing the necessary control measures, checkpoint data, and graphics which provide a simple but clear picture of the company's mission.

  NOTE: The FBCB2 map should display preselected control points along the route of march. This technique facilitates control of the platoon's movement, early linkup, and coordination.

- Transmitting completed overlays to the rest of the company and once receipt is acknowledged, briefing the platoon leaders using the FBCB2 screen or voice systems.
- Issuing a fragmentary order (FRAGO) covering the key elements of the enemy and friendly situations, the company mission, and the concept of the operation.
- Using FBCB2 overlays to conduct platoon and company rehearsals.

  NOTE: Prior to the actual mission, the commander must ensure that all necessary reports created in the FBCB2 during the rehearsal are deleted.

With the advent of digitization, the process of planning and coordination within the company can be compressed and the company commander can spend more time on supervisory tasks.

Receive the Mission

The mission is received either in writing or as an oral order. Normally, the order will be preceded by a WO from the engineer battalion. The company commander starts planning upon receipt of the WO with the

information available. He plans backwards to ensure that key parts of the mission are adequately planned and that planning time is well-spent. He tries to use one-third of the time available to provide two-thirds of the time to his subordinates for planning at their levels. The engineer commander will have advanced warning of the mission because of his role as the TF engineer. He can then begin his TLPs with the receipt of the TF's WO. This gives him a head start on the other company commanders within the TF.

Issue the Warning Order

The WO should include, as a minimum, the following information:

- The situation and the mission type (attack, defend, or delay).
- The time the operation starts (start-point [SP] time, line-of-departure [LD] time, or no later time to defend).
- The time and place of the company OPORD.

Any other available information should also be part of the WO (such as information needed to begin preparation and required precombat inspections); however, the order should be issued as soon as possible to allow planning to start. Subsequent WOs may be issued as more information becomes available. See page B-5 for additional information on the WO.

Make a Tentative Plan

A tentative plan requires a substantial amount of information and generally follows the development of the SITEMP. During this planning step, the commander seeks to understand the enemy he will face and the terrain on which he will fight. The tentative plan focuses his understanding of the engineer company's contribution to the TF fight. The EBA process of the engineer estimate will provide the company commander the information he needs to develop the SOEO, which is the basis for his company's tentative plan. The collocation of the engineer CP with the TF TOC enables the engineer to have access to C^2 information and graphics on the battalion/TF MCS. The MCS provides a digital link to terrain products located on the FXXI division terrain home page and in the DTSS database. The company may also request additional DTSS and terrain support through the engineer battalion. MCS digital reports, overlays, and orders are transferred to the platoons via the FBCB2. The company should send a digital IPB or, at a minimum, a terrain-visualization product to the engineer platoons to aid in their planning.

Initiate Movement

Based on the commander's tentative plan, it may be necessary to move the company or task-organize engineer platoons to other companies/teams in the TF. The company SOP should allow the company to move to its new location. When attaching or detaching platoons, the following should be considered:

- The time and place of linkup.
- Recognition signals.
- Call signs, frequencies, and communications security (COMSEC) variables.
- The tactical situation (why the platoon is being task-organized).
- The CSS status and requirements.

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Reconnoiter

The commander, platoon leaders, and a security element reconnoiter the terrain where the operation will be conducted. The 1SG and platoon sergeants will supervise the company's preparation for combat concurrently with the leader's reconnaissance. The reconnaissance should be as extensive and detailed as possible within the time limits available. If time is short, a thorough map reconnaissance should be done. The reconnaissance effort should be organized and focused on the company's mission. The following are normally reconnoitered in the company's AO:

- Observation and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach (OCOKA).
- Vehicle positions.
- Routes the company will use.
- Fire-control references, including target reference points (TRPs) and EAs.
- LDs and phase lines (PLs), if they can be seen.
- Terrain to the company's flanks and rear, especially along the flanks.
- Danger areas.
- Known or suspected enemy locations.

Complete the Order

With the information gained from the reconnaissance, the engineer commander and XO finalize the SOEO and the company's scheme of maneuver. The plan should be simple, with enough information to complete the mission without further instructions. It should also be flexible to allow the company to react to changing situations quickly. It is critical that the platoon leaders understand their purpose during the operation.

The execution matrix is used to help complete and execute the plan. The matrix is not designed to replace a verbal order with an overlay, a terrain model, or an operational sketch; it is designed to help the company commander develop and execute the order. During the operation, the company leaders refer to the matrix for C^2 information. Figure 2-3 shows an example of an execution matrix.

Issue the Order

The commander issues the order at the time and place specified in the WO. Normally, the order is issued on terrain overlooking the battlefield prior to the TF OPORD, if possible. This allows the platoon leaders the maximum planning and coordination time if they are task-organized to a maneuver company/team. This is an especially effective technique during defensive operations. If this is not possible, then the use of terrain models, sketches, maps with overlays, and sand tables can be very effective in helping the platoon leaders visualize the operation.

Before starting the company order, the commander ensures that his subordinate leaders have their overlays attached to their maps. He then orients everyone to the terrain. The order normally covers the commander's intent and concept of the operation by ensuring that the platoon leaders are able to visualize the operation and understand their unique contributions to the operation. Possible contingencies and the company's reactions to those contingencies are also covered. The commander ensures that the platoon leaders understand how their missions fit into the overall scheme of maneuver. Before concluding the order, subordinates repeat the critical instructions they have received. Figure 2-4, page 2-12, illustrates examples of TF, engineer company, and engineer platoon time lines for orders preparation.

- For overwatch, obstacle handover, and passage of lines (lane closure) with the companies/teams.
- For obstacle location, siting, and construction standards with the TF.
- For CSS plans (including logistics release points [LRPs], unit maintenance collection points [UMCPs], aid stations, prestocks, Class IV/V supply-point locations, combat trains, and decontamination sites) with the TF or battalion S4.
- For field-fortification location and construction standards with the companies/teams.
- For reconnaissance and surveillance (R&S) plans with the TF S3/S2.
- Obstacle locations for adjacent units.

TASK-FORCE INTEGRATION

The company CP normally collocates with the TF TOC during the operation's planning phase. The company CP serves an important function within the TF. It allows the company commander the freedom to command and supplies a dedicated engineer planning section to the TF battle staff. The company commander must provide direction, guidance, and intent to the company operations section in the CP. This facilitates TF integration.

The company XO leads the company CP. He works closely with the TF S2 to develop the SITEMP, particularly in the arenas of terrain analysis and enemy engineer capability. The XO works with the S3 during the COA development and analysis processes. He recommends where obstacles, fortifications, and other engineer efforts can support the TF during the defense. In addition, the XO works closely with the TF FSO during defensive operations for integration of fire-support planning into the obstacle plan. In the offense, he must ensure integration of fire-support planning into breaching operations.

During the offense, the XO recommends where breaching assets should be task-organized and which type of breaching system would be best employed. The engineer company commander will normally provide the engineer XO with planning guidance and engineer company status. The commander will make his own recommendations on which engineer assets should be task-organized and where.

The XO is assisted by the company operations sergeant, the NBC NCO, the communications chief, and the CP-vehicle operator. The engineer CP's vehicle must be a dedicated vehicle with the same C4I capability as the engineer commander's combat vehicle and with the same survivability and mobility as the TF TOC. This allows the CP to operate 24 hours a day and provides for continuous planning and reporting.

The commander gives the XO guidance on using the engineer company. Task-organization recommendations, current equipment availability, and the training level are the commander's to assess, and he provides this guidance to the XO for the planning cell to effectively contribute to the TF planning process.

The engineer company commander frequently accompanies the TF commander during the leader's reconnaissance and assists in the TF commander's development of the command estimate. The company commander's ground reconnaissance can provide pertinent information to the XO and assist him in developing the SOEO.

COMMAND AND CONTROL OF OPERATIONS

The planning process provides the engineer company with the framework for executing the operation. However, the realities of combat demand that leaders be prepared for the unexpected. They must be able to read the terrain, enemy, and friendly situations and understand how these factors might require changes to the plan. They must be capable of making modifications to the original plan and issuing FRAGOs to implement those modifications. They must be capable of exercising their personal influence on the outcome of the battle. The following paragraphs provide techniques to help achieve success. The engineer company commander provides a unique and capable C^2 resource to the TF to facilitate operations.

The success of this C^2 process rests mainly on the leadership, training, thorough understanding of SOPs, and effective use of C4I systems and procedures. During all phases of an operation, a FXXI unit can receive and send FBCB2 overlays, preformatted reports, and free-text messages that assist in executing C^2 functions. For maximum efficiency, the commander must keep this process simple while maintaining the company's SA through FBCB2 or face-to-face meetings. Traditional acetate maps and overlays (analog graphics/information) should still be used as a backup in the event of communications failures.

The engineer company commander places himself so that he can see the most critical engineer company mission. Terrain and weather should be used to conceal movements from the enemy, but the commander must maintain either visual or radio contact with the platoons. **NOTE: If the most critical engineer platoon is not under engineer company control, a good technique is for the company commander to eavesdrop on that platoon's or the attached company's/team's net to keep current on the situation.**

In the FXXI environment, the technique of eavesdropping is not recommended to avoid voice and digital contention.

Since digital and voice transmissions occur over the same communications path for vehicles equipped with only the single-channel, ground-to-air radio system (SINCGARS) System Improvement Program (SIP), the leaders should stress procedures to minimize potential voice/digital contention. Therefore, rehearsals should stress the need to minimize frequency-modulated (FM) transmissions prior to enemy contact to ensure timely receipt of FBCB2 reports. During these rehearsals, the platoon leader must remember to prepare and transmit digital follow-up contact, a situation report (SITREP), and spot reports (SPOTREPs) after contact has been established with the enemy. If a non-FXXI-equipped unit is attached to the company, these rehearsals become pivotal for their integration.

The company commander synchronizes actions with the other company commanders. When something critical happens, he quickly sends the TF commander a SITREP. If contact is lost, he makes every effort to reestablish communications short of abandoning the mission. Until communications can be reestablished, he continues to take actions that best accomplish the TF commander's intent.

The engineer company commander must see the battlefield. He prepares to change and update his estimate of the situation at any time. He uses initiative and understanding of the company's purpose to see ahead and to identify potential problems before they arise. When it is clear that the original plan will not work or a better opportunity presents itself, he modifies the plan quickly and aggressively to meet the changing situation. The commander should seek to lead engineer soldiers rather than task-organize all of his forces to other elements.

The commander demands that subordinates maintain contact with him and keep him informed of their situations. If the commander cannot communicate with subordinate leaders, he has lost control of the company and failed in his primary mission on the battlefield.

A FXXI unit must verify that FBCB2 and digital links are established with higher headquarters, adjacent units, and platoons; that each vehicle's FBCB2 is operational; and that user identification, call signs, mission overlays, and correct map scales have been entered.

When the platoon establishes contact with the enemy, reporting via digital means may become too cumbersome. Units should have an SOP which addresses communication procedures after contact has been established with the enemy. For example, the SOP should designate who at each command echelon will monitor FM-voice traffic and in turn prepare/transmit required digital reports to higher headquarters. Digital reports must be sent to higher headquarters so that a common picture of the battlefield is generated and subsequently shared among all the command's FBCB2 systems. This will free the company commander and his platoon leaders to fight the battle while reporting battle events by the most expeditious means possible (such as FM voice).

Battalion, company, and platoon SOPs must clearly define what these time settings will be for each operation. Unless the setting is standardized throughout all command elements, position/location data generated will become suspect, SA will be lost, and the potential for fratricide will be increased.

The commander issues timely and clear FRAGOs. He tells platoon leaders what he wants them to do and why. He issues WOs, giving the platoons time to react to all possible upcoming missions. He continually updates subordinates on the enemy situation as well as the situations of the TF's other elements.

The commander encourages the company's key leaders to cross-talk on the company command net to coordinate their actions and to ensure that the company has a clear picture of what is happening. The commander uses SOPs and tactical techniques that can be executed quickly with a brief message. He uses checkpoints and terrain features to orient the company and to control its movement from one position to another.

The commander can quickly lose control if the entire company is operating on the command net. The A&O platoon net can be used as the company administrative and logistical (A&L) net if the signal operating instructions (SOI) provides none. The XO, the A&O platoon leader, and the 1SG can use this tactical frequency to synchronize the company logistics operation without crowding the company command net.

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CHAPTER 3

OFFENSIVE OPERATIONS

This chapter deals with planning and executing an offensive operation. It does not cover all of the tactical issues dealing with the TF in the offense, but looks instead at the interface that must occur between the TF and the engineer company during offensive operations.

OFFENSIVE CHARACTERISTICS

The engineer company provides a significant offensive capability to the force. The engineer company is the primary agent of obstacle breaching and fortification reduction available to the TF or the engineer battalion. The engineer company normally fights as part of a TF or with the engineer battalion during the offense.

The offense's main purpose is to defeat, destroy, or neutralize the enemy force. The fundamental characteristics of offensive operations are surprise, concentration, tempo, and audacity. These characteristics are all subcomponents of initiative.

SURPRISE

Surprise is achieved by striking at a time or place or in a way that the enemy is not physically or mentally ready for. Engineers achieve surprise through covert breaching operations and the use of situational obstacles. Surprise avoids the obvious and strikes the enemy's weakest point. Engineers enable surprise by rapidly overcoming obstacles, increasing the force's tempo. Increased situational awareness and terrain visualization will enable the engineer company to achieve surprise because of its better understanding of the enemy's defensive preparation.

CONCENTRATION

Concentration of effort is critical to the attacker's success. Concentration of effort does not necessarily mean the massing of large formations. To achieve concentration, all fires must be used at a decisive place and time to destroy the enemy. Concentrating breaching assets, fortifications, and obstacle effects all directly impact on the maneuver unit's ability to concentrate the terminal effects of its fires. The engineer company concentrates breaching assets to overcome fortifications and obstacles at the point of penetration as part of the TF's breaching plan.

TEMPO

Tempo is the speed of military action. The ability to control or alter tempo is essential for maintaining initiative. Engineer speed and flexibility are crucial to the attack. Rapid mobility operations by engineers ensure the TF's tempo. The ability to quickly breach, mark, and guide units through complex obstacles is the engineer's hallmark.

AUDACITY

Audacity is the bold courage to exercise good judgment and take decisive action in a fast-paced, constantly changing situation. The audacious commander is quick, decisive, and willing to take prudent risks.

SEQUENCE OF THE ATTACK

Generally, the following sequence of events are followed when the TF attacks: *reconnaissance, movement to the LD, maneuver, deployment, attack,* and *consolidation and reorganization.*

RECONNAISSANCE

Reconnaissance begins as soon as practical following the receipt of orders to attack. The engineer company assists in the reconnaissance by developing a detailed enemy obstacle template and ensuring that obstacle intelligence (OBSTINTEL) requirements are included in the R&S plan. Engineer patrols or individual engineers with other reconnaissance elements can be used to observe specific named areas of interest (NAIs) to gain information on the enemy's barrier plan and to determine any weakness that the TF can exploit. Engineer-specific reconnaissance must be integrated into the TF's R&S plan to preclude confusion, reconnaissance overlap, and fratricide.

MOVEMENT TO THE LINE OF DEPARTURE

The TF normally moves from an assembly area or defensive position to the LD. Engineers ensure that the TF can move to the LD without pause. They create passages and provide guides through situational obstacles along the TF's march route. This is especially critical during a forward passage of lines.

MANEUVER

As the TF maneuvers to a place of advantage, the engineer company ensures the TF's mobility. Engineers supporting the TF can quickly breach, bypass, and mark obstacles along the axis of advance. Engineers place planned situational obstacles protecting the TF's flank during movement.

DEPLOYMENT

The TF deploys to attack or fix the enemy. The engineer company prepares to breach, mark, and guide the TF through the enemy's obstacles.

ATTACK

The TF attacks, bypasses, or assaults the enemy position. The engineers breach the tactical and protective obstacles and mark lanes, guiding the TF through to the objective. Engineers may also assist in the assault breaching of protective obstacles.

The FBCB2 system facilitates premission planning and force protection, movement, and precision maneuver. It expedites reporting during and following the attack.

- FBCB2 enables—
  - — Premission planning. During mission preparation, the TF commander may, for security reasons, elect to conduct all mission planning via digital means to avoid disclosure of movement or change in mission. In this case, the FBCB2 is used to coordinate with the battalion, the TF, and between platoons through the sharing of orders, free-text messages, intelligence data, and digital overlays. Following plan completion, the TF commander can use the FBCB2 to accomplish mission rehearsal and to finalize planning.
  - — Force protection. The TF commander will use the FBCB2 to prepare a digital overlay that clearly defines the TF's movement plan. This digital overlay is a graphic representation of the unit's route of march and all control features used along the route of march to facilitate uninterrupted and silent movement. Some of the control measures that may be included are SPs, release points (RPs), checkpoints, and way points. Routing around enemy units to be bypassed or lanes that facilitate movement through enemy obstacles will also be shown.
  - — Precision movement. The FBCB2 will be used to effect C^2 as the TF deploys to forward assembly areas. Using the digital overlay provided as part of the movement order, the TF is able to conduct a precision move to its forward assembly area. This precision movement can be

conducted over concealed routes while maintaining a high degree of SA related to the location, disposition, and activities of enemy units operating in the near vicinity of the TF's route of march. In addition, reporting is not required between march elements or higher headquarters since the move can be monitored by the battalion-level FBCB2.

— Reporting. Upon reaching TF objectives following the attack, the TF can quickly roll up and report its personnel and equipment losses and logistical support requirements using digital report formats.

• Enhanced engineer mobility systems (Grizzly and Wolverine) enable—

— Obstacle breaching. TF assets previously used to breach an obstacle are no longer required with the advent of new armor-protected engineer mobility systems. This means the TF commander can now remain focused on suppressing, obscuring, and securing an obstacle versus assisting in its reduction.

— Operational tempo. The Grizzly and Wolverine put the engineer on an equal mobility and survivability (M/S) footing with that of the mechanized and armor forces supported. This means that engineers equipped with these systems can ensure that desired operational tempos can be maintained based on systems design and mobility.

CONSOLIDATION AND REORGANIZATION

As the TF eliminates all remaining enemy resistance, the engineer company reduces the enemy obstacle system, consolidates near the objective and, if necessary, starts to prepare hasty defensive positions for the TF. The engineer company plans and emplaces situational obstacles to protect the TF from enemy counterattack. As the TF, along with the engineer company, consolidates on the objective, ACEs rapidly prepare initial vehicle fighting and protective positions. Emplacement excavators move forward from the combat trains to prepare personnel positions.

FORMS OF MANEUVER

The basic forms of offensive maneuver are envelopment, turning movement, infiltration, penetration, and frontal attack. Attacks frequently use multiple forms of maneuver to achieve the desired effect on the enemy. Double envelopment and turning movements normally require large force structures and are more applicable to division level or higher operations and are covered in FM 71-100.

It is imperative that the TF engineer understands each form of maneuver and its implications to the engineer scheme of operations and task organization. Table 3-1, page 3-2b, describes digital impacts to the forms of maneuver.

ENVELOPMENT

An envelopment is the preferred form of offensive maneuver. The envelopment seeks to strike the enemy on his flanks or rear. The envelopment is designed to force the enemy to fight in a direction from which he is least prepared. The envelopment requires an assailable flank. The enemy's defensive positions and obstacle systems and the terrain will define the flank—not the attacker's march direction (see Figure 3-1).

Table 3-1. Digital impacts to forms of maneuver

Forms of Maneuver	Digital Impacts
Envelopment	• Engineers use the SITEMP and current recon information displayed on their FBCB2 to gain near-real-time SA of known and templated enemy obstacles and to determine if there is an assailable flank.
Infiltration	• Digital C4I systems, improved SA of the enemy, and terrain visualization allow the mechanized engineers to infiltrate mounted, if required. • Enhanced FBCB2 capabilities enable the engineers to conduct tactical movements over covered and concealed routes using preselected checkpoints. • The commander will be able to track the movement of each vehicle within the company and simultaneously maintain SA of the enemy being reported through FBCB2.
Penetration	• Digital obstacle overlays and lane locations are transmitted (via FBCB2) up the chain to the engineer company and battalion for rapid dissemination to follow-on engineers.
Frontal Attack	• Digital communications and improved SA allow the engineer commander to accurately predict breaches and task-organize to react to changing battle-space situations. • FBCB2 enhances the commander's ability to concentrate his forces faster and increases the tempo with which all actions can be performed.

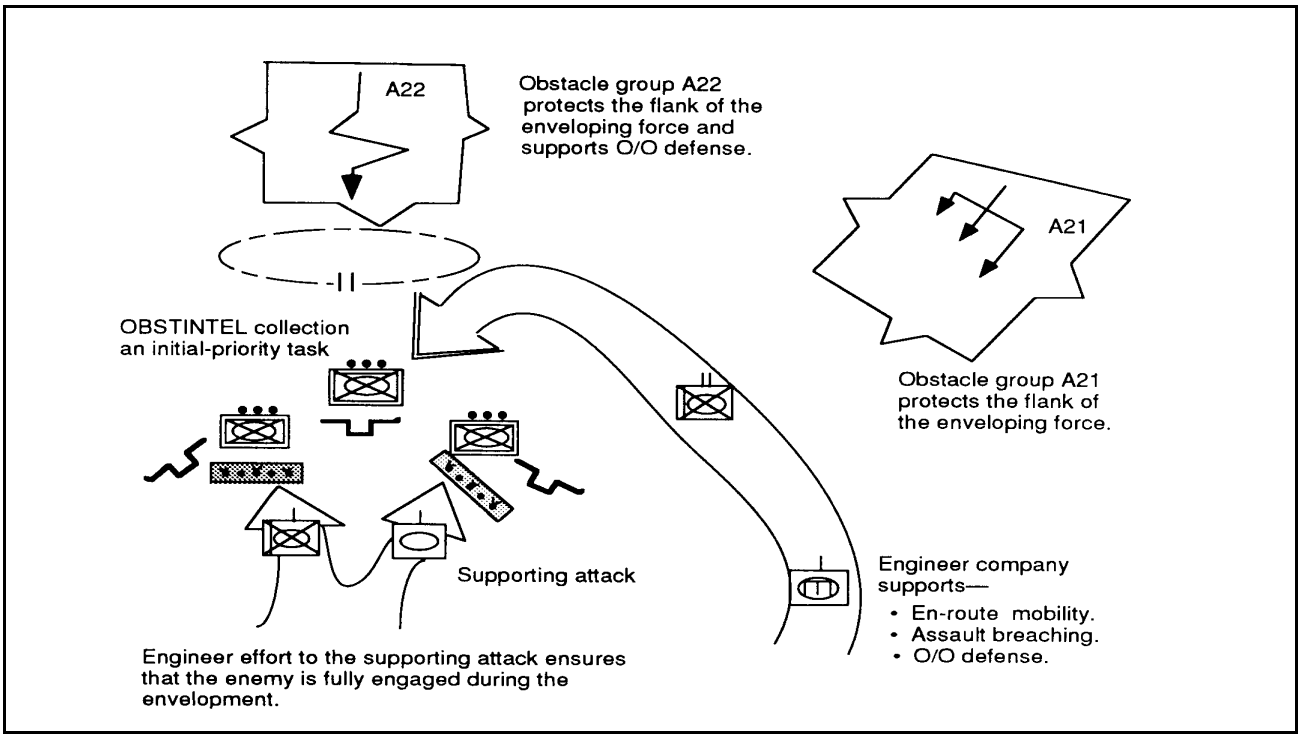

Figure 3-1. Engineer support for envelopment

Engineers plot known and templated enemy obstacles to determine if there is an assailable flank. Breaching an obstacle system can provide the flank the TF commander needs; therefore, the enemy's obstacles and terrain must be adequately studied.

INFILTRATION

During an infiltration, combat elements use stealth to gain the enemy's rear position without fighting. Infiltrations are slow and usually conducted during times of limited visibility. Successful infiltration requires extensive reconnaissance to discover covered, concealed, and undefended routes. Engineers normally support infiltration through covert breaching. The plan's success should not hinge on the covert breaching of minefields due to the possibility of antihandling devices (AHDs) on the mines. All covert breaches should have backup plans to become deliberate breaches if compromised.

PENETRATION

The TF seeks to concentrate on a small front to rupture the enemy's defense. There are three phases of the penetration: rupturing the enemy's position; widening the gap; and securing the objective, thus destroying the continuity of the defense. Normally, the TF will mass on one enemy platoon to create a gap in the enemy's defensive position.

A penetration is normally attempted when the enemy presents no assailable flanks. Engineers support the penetration by breaching the tactical and protective obstacles during the rupture phase. The engineer company widens the gap through obstacle reduction and supports securing the objective by guiding follow-on forces quickly through the gap. The engineer company must prepare to conduct an obstacle hand-over to follow-on engineers and then continue the attack. Digital obstacle overlays and lane locations are transmitted up the chain to the engineer company and battalion for rapid dissemination to follow-on engineers. The unit SOP must consider the importance of time to compile the information and distribute it at each level sequentially. FBCB2 enables FXXI units to graphically transmit the information to all levels simultaneously. Engineers plan, and possibly execute, situational obstacles to delay and disrupt enemy counterattacks (see Figure 3-2, page 3-4).

NOTE: FXXI units must still maintain a hard copy of their DA Forms 1355 to provide backup and for coordination with non-digital units.

FRONTAL ATTACK

This is the least preferred offensive maneuver. In a frontal attack, the TF uses the most direct route to attack the enemy and generally attacks the enemy where he is most prepared to defend. This attack is normally done when the TF, as part of a larger attack, has the mission to fix the enemy or to deceive them. Frontal attacks, unless in overwhelming strength, are seldom decisive (see Figure 3-3).

FORMS OF OFFENSIVE OPERATIONS

Engineers at all levels find or create a weak point in the enemy's defensive obstacles and assist in suppressing the enemy's fires, isolating the enemy, maneuvering against weak points, and exploiting success.

FMs 71-1 and 71-2 contain a description of each offensive form. The engineers in the TF must understand the principles and organizations of each offensive form to provide appropriate planning and force allocation to support the TF's attack.

MOVEMENT TO CONTACT

The TF conducts a movement to contact (MTC) to make or regain contact with the enemy. The engineer company normally participates as part of the TF. Engineers will be positioned in the TF formation depending on the expected enemy disposition. By definition, the enemy situation during an MTC is unclear. However, enemy analysis will indicate whether it is likely that the enemy is expected to be moving or stationary. Engi-

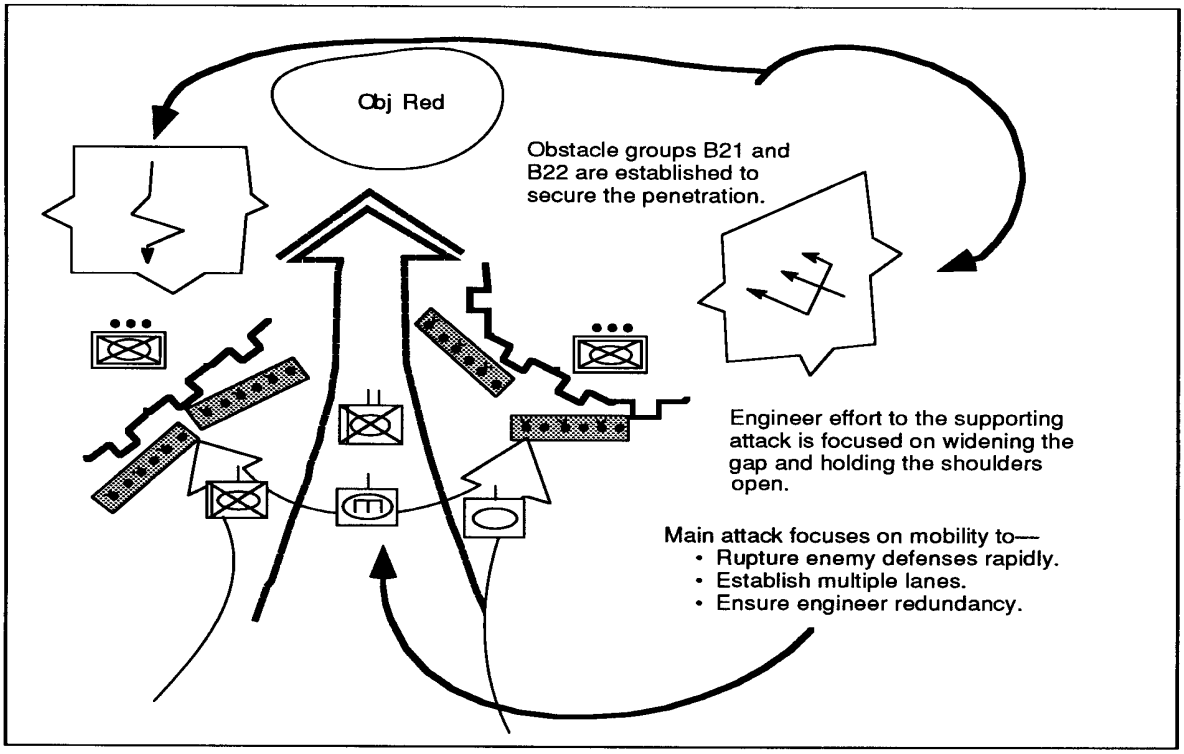

Figure 3-2. Engineer support for penetration

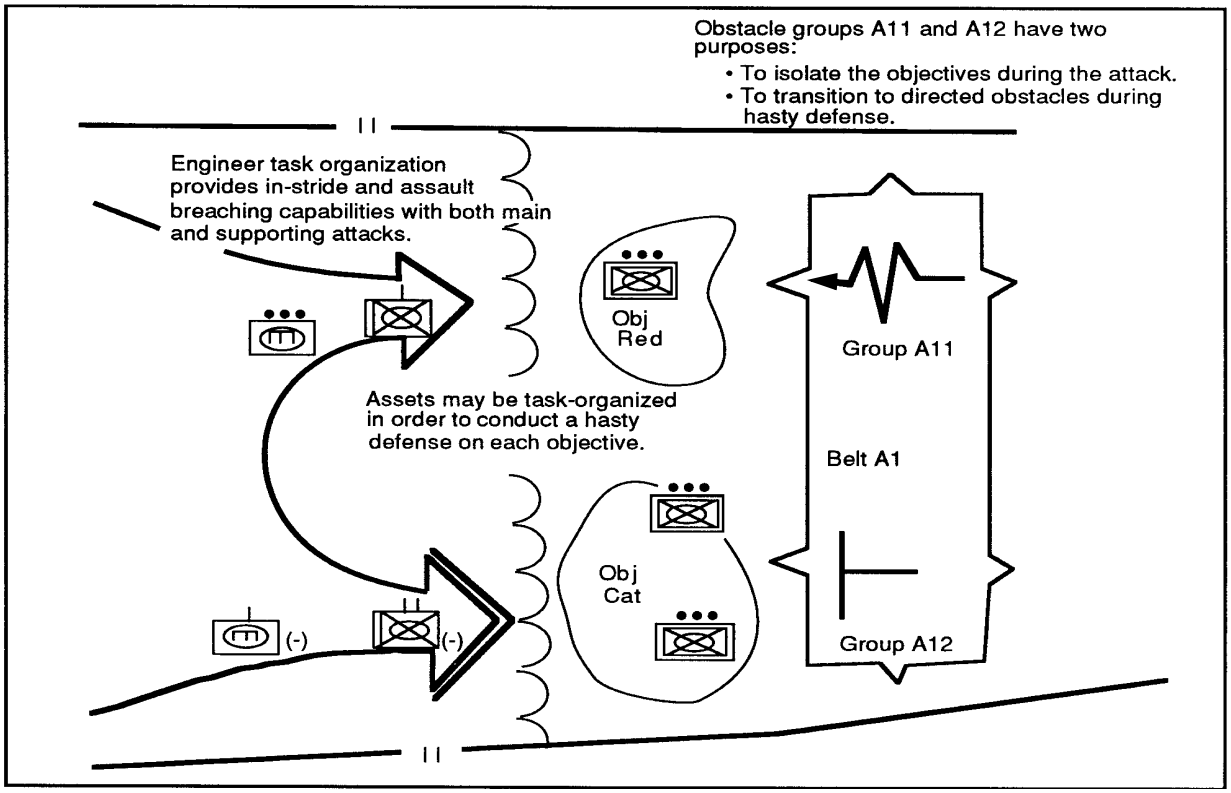

Figure 3-3. Engineer support for frontal attack

neer task-organization guidelines are discussed later in this section.

The desired result of a MTC is to find the enemy. When this occurs, the TF may deploy and conduct an attack or assume a hasty defense. When the TF attacks, engineers are prepared to breach and support flank security for the attacking force. When the TF assumes a hasty defense, engineers rapidly install obstacles and construct fighting positions to support the defense.

The engineer company must be flexible and prepared to deal with any obstacle that restricts the TF's movement. The engineer company will normally move under the company commander's control to facilitate quick movement to a flank, to emplace situational obstacles, or to quickly breach any unforeseen obstacles. Key planning considerations include movement and task organization. FXXI engineers will capitalize on their enhanced SA and C4I systems to anticipate the enemy's movement and subsequently trigger situational obstacles. It is imperative that the platoon leader (PLT LDR) maintain SA and communication with his company commander in the event of movement or task organization changes.

Movement

The engineer company will orient on the objective as part of the TF along the axis of advance. The company moves consistent with the following factors:

- The speed required by the TF.
- The available AAs.
- The requirements for maintaining mobility, security, and situational-obstacle emplacement.
- Bypassing or in-stride breaching, when possible.
- Reacting to contact faster than the enemy.

- Retaining flexibility in the breaching or bypassing location, technique, and organization.

Based on the increased SA data received through the FBCB2, the FXXI company commander is better able to synchronize his movement with that of the TF and manage movement tempos. Advanced navigation aids and increased SA allow elements within the TF to be dispersed during movement but quickly concentrated at decisive points and times of the commander's choosing. This facilitates an attack of the enemy from locations and positions where he least expects it.

Task Organization

The TF is normally organized with a security force, advance guard, main body, and flank and rear guards.

Engineer elements can be placed with any of the forces mentioned above. Generally, the engineer company travels behind the advance guard. Engineers can be placed with the security force and scouts to gain OBSTINTEL, to conduct route reconnaissance, and to ensure the advance guard's mobility.

The advance guard is initially the TF's main effort. Its task organization is METT-T dependent. The engineer company follows or attaches elements to the advance guard. The advance guard provides security to the TF's main body and attempts to gain contact and develop the situation for the main body to exploit. Engineers with the advance guard rapidly overcome obstacles, allowing the advance guard to develop the situation.

The main body normally moves 1 to 2 km (0.5 mile to 1.25 miles) behind the advance guard, though METT-T considerations drive its exact location. In many situations, the engineer company will be the main body's lead element. The main body must be close enough to the advance guard to respond to the situation, but not be tied down by the advance guard's fight. The engineer company must be able to move rapidly to overcome obstacles, thus allowing the main body to attack. Engineers provide flexibility to the TF, allowing rapid maneuver to the decisive point to destroy the enemy.

Flank and rear guards protect the TF as it moves, keeping it from being attacked from these directions. Engineers support the flank and rear guards with situational obstacles, enhancing the TF's protection and security.

The priority of engineer effort is the TF's mobility. Elements of the engineer company will assist the security forces with reconnaissance. Engineers with the advance guard provide rapid mobility for both the advance guard and the main body. The engineer company moves to the advance guard's rear to provide responsive support to the main effort's movement. Situational obstacles are planned to support the security force and the advance guard.

ATTACK

There are two types of attack, hasty and deliberate. The hasty and deliberate attacks differ only in the amount of planning and preparation time. The deliberate attack normally requires extensive planning, rehearsal, and reconnaissance. The hasty attack is usually the friendly force's reaction to the enemy situation.

Hasty Attack

Hasty attacks are conducted as the result of a meeting engagement, when bypassing the enemy has not been authorized, or the enemy is discovered in an unprepared or vulnerable position. There are two types of hasty attacks: against a moving enemy force and against a stationary enemy force. During the hasty attack, the first to react and to maneuver to a place of advantage usually wins.

When attacking a moving force, the advance guard seeks to fix the moving enemy while the TF's main body maneuvers to attack the enemy's flank or rear. The TF must interdict the enemy who seeks to do the same thing. Engineers support the attack by rapidly emplacing situational obstacles to assist the advance guard in fixing the attacking enemy

force. At the same time, engineers swiftly reduce enemy situational obstacles, allowing the TF to maneuver into the enemy's flank or rear.

A hasty attack against a stationary force is initiated after the TF reconnaissance elements discover flanks or weaknesses in an enemy's defense. Reconnaissance must be done quickly, before the enemy has a chance to counter. As in the attack on a moving force, a TF attempts to fix an enemy with the advance guard while the main body maneuvers to the flank or rear of the enemy's position.

Engineers support the attack by breaching obstacles to allow the advance guard to move into a position to fix the enemy. As the main body maneuvers, engineers emplace obstacles to protect a TF's flanks, and they breach obstacles to allow the main body to attack into the enemy's position.

Deliberate Attack

A deliberate attack is characterized by detailed planning, reconnaissance, and preparation. It generally includes large amounts of preparatory and supporting fire, main and supporting attacks, and deception.

A deliberate attack requires time to collect information about the enemy and his defensive preparations. The engineer uses the terrain-visualization systems to develop an accurate picture of the battle space. This, coupled with the information that the S2 has downloaded from the All-Source Analysis System (ASAS), will enable the staff to achieve better resolution with the SITEMP and to better focus the R&S plan.

Reconnaissance confirms the enemy's disposition and extensive planning develops a scheme of maneuver to defeat him. Generally, obstacle reconnaissance should be done by the soldiers who will breach the obstacles. Engineers will be actively involved in the collection of OBSTINTEL as part of the preparation for the attack. With digital communication systems, the engineer reconnaissance elements can transmit timely and accurate OBSTINTEL to the XO, TF engineer, and TF staff. Where engineers cannot actively do the reconnaissance, OBSTINTEL is coordinated with other reconnaissance elements. The TF engineer ensures that OBSTINTEL is planned and that obstacles are critical information requirements.

The TF commander should establish support, breach, and assault forces to overcome the enemy's defensive positions. The engineer company will be employed with the forward elements of the main attack to enhance a TF's mobility. Engineer elements will accompany a TF's breaching force (preferably, the engineer company is task-organized as the TF's breaching force) and assist in reducing and crossing all obstacles encountered. The decision of who is the breaching force and what type of breach is best is based on careful METT-T analysis. Covert breaching is used to attack the enemy's obstacle system (before the main attack) to gain surprise. Engineers could also task-organize with the assault force to breach enemy protective obstacles and to destroy enemy fortifications. Situational obstacles can be used behind the enemy to prevent repositioning, delay enemy counterattacks, or fix the enemy in his defensive positions. However, with FXXI modified tables of organization and equipment (MTOEs), the engineer company commander is best suited to be the breach force commander.

EXPLOITATION

Exploitation is designed to take advantage of the initiative gained from the attack. Exploitation is the desired outcome of a hasty or deliberate attack. This form of maneuver prevents the enemy from reconsolidating an organized defense or conducting an orderly withdrawal. A TF will normally be part of a larger force during an exploitation. The two key components of an exploitation are speed in execution and maintaining pressure on the enemy.

An engineer company supports the exploitation as part of a TF. The engineer's organization is similar to that of a MTC with a

responsive, flexible organization that can rapidly overcome any obstacles. Planning and preparation time will be very limited in an exploitation and will require an extremely versatile engineer force that can change organization on the move.

PURSUIT

Pursuit is the natural culmination of a successful exploitation. Pursuit differs from exploitation because it focuses primarily on the enemy force versus a terrain objective. The purpose of the pursuit is to chase down the enemy and kill him.

The engineer company will support a TF through mobility and countermobility. Enemy obstacles must be rapidly overcome to ensure that the enemy is under constant pressure and is not allowed time to establish a coherent defense. The TF engineer will recommend situational obstacles that fix the enemy in specific areas and disrupt his withdrawal, facilitating his destruction.

FXXI OFFENSIVE OPERATIONS

The forms of tactical offense may be altered when operating in a FXXI environment. FXXI operations are characterized by individual units conducting distributed (nonlinear, dispersed, and simultaneous) operations throughout an expanded battle space. Enhanced SA and information dominance will permit the commander to accurately "see" the entire battle space and to out think, out maneuver, and react quicker than the enemy. This allows the TF commander to execute offensive operations with a reduced number of maneuver companies (three maneuver companies in the FXXI TF). Advances in digital communications technology will also facilitate improved battle command.

Boundaries will change dramatically and often in the high tempo and fluid digital environment. The engineer's ability to rapidly affect mobility over a wide frontage and the lasting effects of situational obstacles require that the engineers maintain a greater degree of SA and adhere strictly to obstacle-control measures.

Digital C4I systems and the information passed over these systems can shorten the planning and preparation phases of a tactical operation. Battalion and above ABCS and other FXXI systems continuously gather combat information and share it with the TF through the FBCB2.

ENGINEER OFFENSIVE PLANNING

The engineer estimate provides the planning framework for the TF engineer to synchronize and integrate engineer-company capability into the TF's scheme of maneuver. Examples of the estimate process are found in Appendix A.

The engineer estimate and offensive planning begin when the TF receives its mission from a higher headquarters. The mission, the higher headquarters' engineer annex, and graphics provide information to develop facts and assumptions. The engineer battalion OPORD and the brigade WO will also provide information necessary to start planning.

The engineer company's primary task during offensive operations is mobility. Generally, this consists of overcoming obstacles presented to the TF along its axis of advance or zone. The engineer company must organize to support the TF's rapid transit of these obstacles. FM 90-13-1 covers in great detail the mechanics, tactics, and procedures for all breaching operations. It should be used as the definitive source for breaching operations.

As part of the planning process, the engineer estimate must provide the framework for the synchronization of engineer forces with the offensive plan. The TF engineer's role is to

identify missions, allocate resources, and synchronize and command engineer functions.

ANALYZE THE MISSION

During mission analysis, the engineer company will receive the mission. First the company commander must determine facts and assumptions. For the engineer, this is the EBA. The EBA is part of the engineer estimate and is covered in Appendix A in greater detail. The EBA seeks to define three things: the terrain, the enemy engineer capabilities, and the friendly engineer capabilities.

Terrain Analysis

The engineer assists the S2 in steps 1 and 2 of the IPB (define the battlefield environment and describe the battlefield's effects). The engineer analyzes the terrain in concert with the S2, if possible. The engineer ensures that the S2 takes into consideration the terrain products available through engineer channels such as the engineer battalion. In the FXXI division, a terrain team equipped with DTSS will be collocated at the brigade TOC or the engineer battalion CP. This greatly aids in the accessibility, response, and quality of terrain visualization and topographic support. These products could include—

- Soil-trafficability analyses.
- Mobility-corridor analyses, to include bridging requirements.
- Line-of-sight (LOS) capabilities/overlays.
- Analysis of the terrain and its effects on the battlefield.

The engineer also ensures that the S2 considers friendly force mobility based on critical assets (most breaching vehicles have less mobility capability than typical combat vehicles for various reasons, such as terrain affecting them differently).

NOTE: The Grizzly and Wolverine are M1-chassis based to provide FXXI engineer units M/S equivalent to maneuver forces.

Enemy Analysis

The engineer assists the S2 in steps 3 and 4 of the IPB (evaluate the threat and determine threat COAs). The engineer is the expert on enemy engineer capabilities. He provides input on how the enemy will employ obstacles, fortifications, and mobility assets during his defense. The engineer templates the enemy's obstacles and develops a detailed analysis of the enemy obstacle effort based on the time available to the enemy. For example, the engineer should estimate—

- The number and type of obstacles the enemy will use, including SCATMINEs (regardless of the source).
- The number and type of mines the enemy will most likely use.
- The amount and type of fortifications the enemy will use.

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The engineer identifies OBSTINTEL and nominates priority intelligence requirements (PIR) for inclusion into the commander's critical information requirements (CCIR). As the IPB continues (throughout the planning process), the engineer is involved in developing the R&S plan, selecting NAIs, and obtaining reconnaissance assets to gain OBSTINTEL.

Friendly Analysis

The engineer prepares an estimate of friendly capabilities. For example, he should estimate—

- The number and type of breach lanes required.
- The number of gap crossings required.
- The number and type of friendly obstacles required.
- The number and type of friendly fortifications required.

ANALYZE RELATIVE COMBAT POWER

The engineer does a comparison of friendly engineer capabilities with the competing enemy capabilities to determine if the mission is tactically feasible. During this process, the engineer must answer the following questions:

- How much breaching/gap-crossing capability do I have in comparison with the existing obstacles and the enemy's obstacle capability?
- How much obstacle-emplacement capability do I have in comparison with the enemy's capability to breach obstacles?
- How much survivability capability do I have in comparison with the numbers of systems I must protect from the enemy?

ANALYZE ENGINEER BATTALION/ MANEUVER BRIGADE MISSION AND INTENT

The engineer analyzes his mission based on the brigade's missions to the TF and the engineer battalion. The company commander must understand both missions regardless of task organization to determine the mission of the engineer company. To properly conduct this analysis, the engineer must—

- Understand the mission and the intent of the next two higher echelons.
- Review the task organization, the engineer battalion's/maneuver brigade's concept of the operation, and the AO.
- Identify specified tasks such as creating breach lanes (brigade in-stride breach); acting as the support, breach, or assault force (brigade deliberate breach); passing follow-on forces; emplacing situational, directed, or reserve obstacles; and constructing survivability assets to dig in brigade assets.
- Identify implied tasks to allow the completion of specified tasks.
- Identify any specified or implied tasks that are mission essential for the TF.
- Identify limitations (constraints or restrictions), including obstacle restrictions, zones or belts, manning or widening lanes, restrictions on using breaching assets, and changes to task organization during the mission.
- Determine any risks the commander may need to accept.
- Conduct a continual time analysis.

NOTE: This process involves information sharing within the staff. The engineer and other staff members may initially work independently, then come together to share information, or the staff may work as a group.

SEEK THE COMMANDER'S GUIDANCE

The engineer needs to seek guidance from the commander on each area of engineer capability if it is not given. He should

request guidance on the use of breaching, obstacle, and survivability assets.

DEVELOP THE COURSE OF ACTION

The engineer participates in the development of the maneuver COA. This ensures his complete understanding of the COA. As each COA is developed, the engineer prepares the supporting SOEO. He must consider integrating engineer capability assets into the operation. He considers the capability he determined during his EBA to ensure that his SOEOs are realistic. A matrix provides a technique for identifying the engineer tasks that support a TF offensive operation.

NOTE: Although advanced capabilities of digital systems will allow the commander to develop a very detailed plan, the plan should be simple to execute.

The following example illustrates this technique:

TF 1-1 attacks in zone to seize Objective (Obj) Blue to destroy a defending motorized rifle company (MRC) not later than (NLT) 060400 September 19XX. The TF will move from AA Dog to the LD on Route Nut in a column formation. The TF will cross the LD in a TF box formation. Two companies/teams will occupy attack-by-fire (ABF) positions 1 and 2 and act as the TF support force. A third company/team supported by the engineers will breach vicinity Pop 1. The forth company/team will assault the Obj. Upon seizure of the Obj, the TF will halt, consolidate, and transition to a hasty defense (see Figure 3-4).

ANALYZE THE COURSE OF ACTION

The staff war-games the COA to determine its viability and to determine the best COA to recommend to the commander. The engineer develops the SOEO within the context of the maneuver COA. The FXXI commander must ensure that the selected COA graphic display in the FBCB2 is not altered. A sample COA sketch on the FBCB2 screen is depicted in Figure 3-4a. Changes, modifications, or updates to this graphic must be strictly controlled. FXXI units must have an SOP to track updates to digital overlays and acknowledgments from those who have received the latest changes. There are some specific considerations that the engineer staff

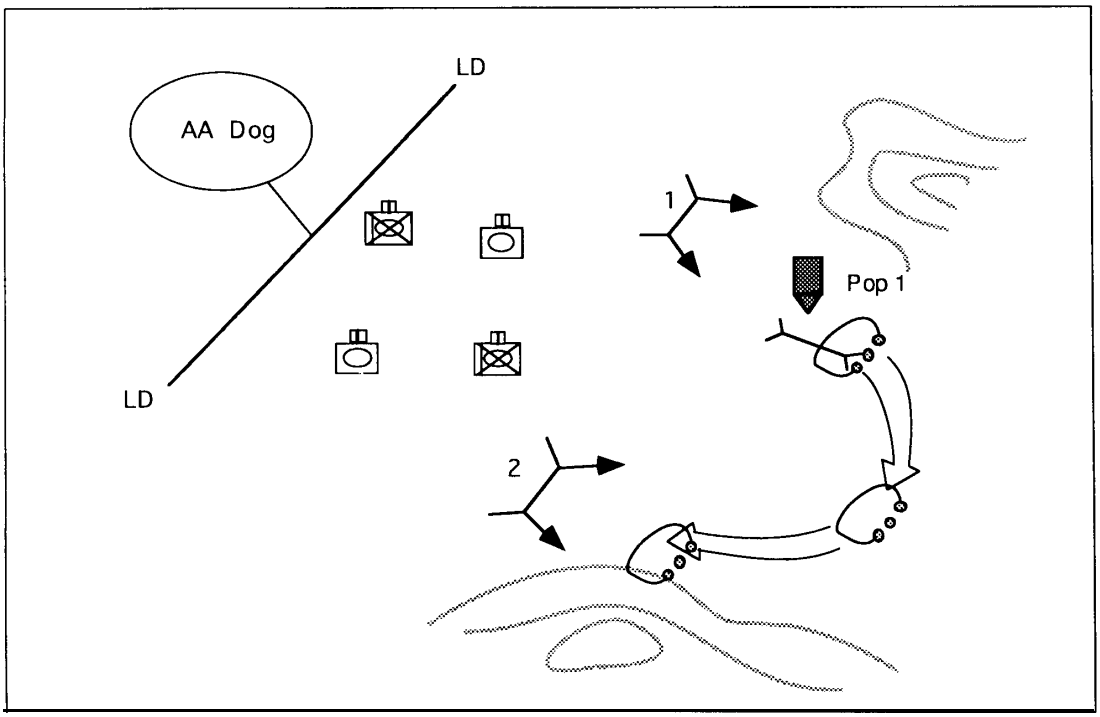

Figure 3-4. COA sketch

officer should consider as he develops his SOEO, including the—

- Breaching capability that makes one breaching technique preferable to another (for example, covert versus

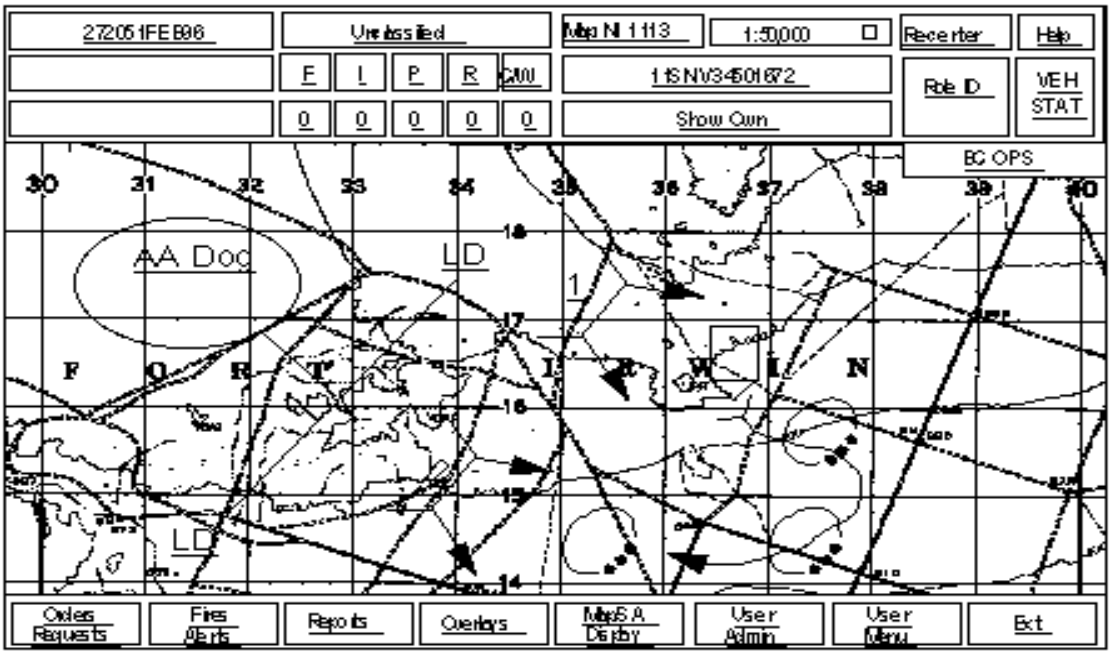

Figure 3-4a. Digital COA sketch on the FBCB2

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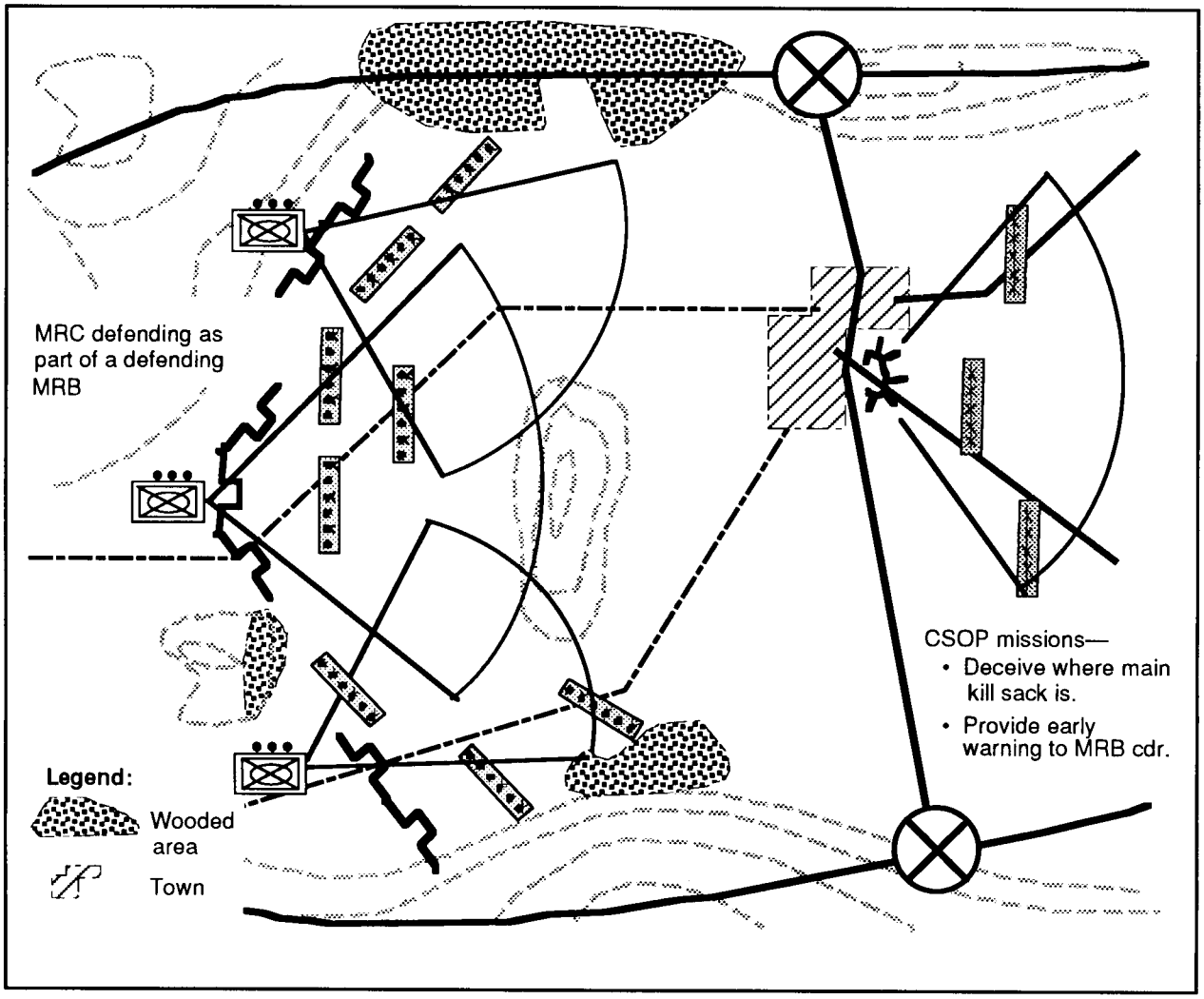

Figure 3-6. Enemy SITEMP with obstacle overlay and weapons-range fans

the combat security outpost and to deal with any obstacles emplaced as part of the enemy's deception. An engineer platoon is cross-attached to the breaching force. This platoon will be equipped with a MICLIC. The breaching team will also have a plow-equipped tank platoon with two plows. The breaching team must create a minimum of four lanes through the tactical obstacles (two lanes in two obstacles) as well as conduct an assault breach of the protective obstacles of the southern platoon. The engineer company (-) follows the breaching team to widen the four lanes to accept two-way traffic and create additional lanes to recover wounded soldiers and damaged equipment. The engineer company is also responsible for marking these lanes and providing guides for the assault force. Both assaulting companies have tank plows to breach protective obstacles encountered during the envelopment.

A situational obstacle group is planned to protect the TF's flank during the assault phase. On order, the engineer company could reinforce the artillery-delivered obstacle with Volcano or conventional mines. The engineer company will also be prepared to start hasty fortification, should the tactical situation require.

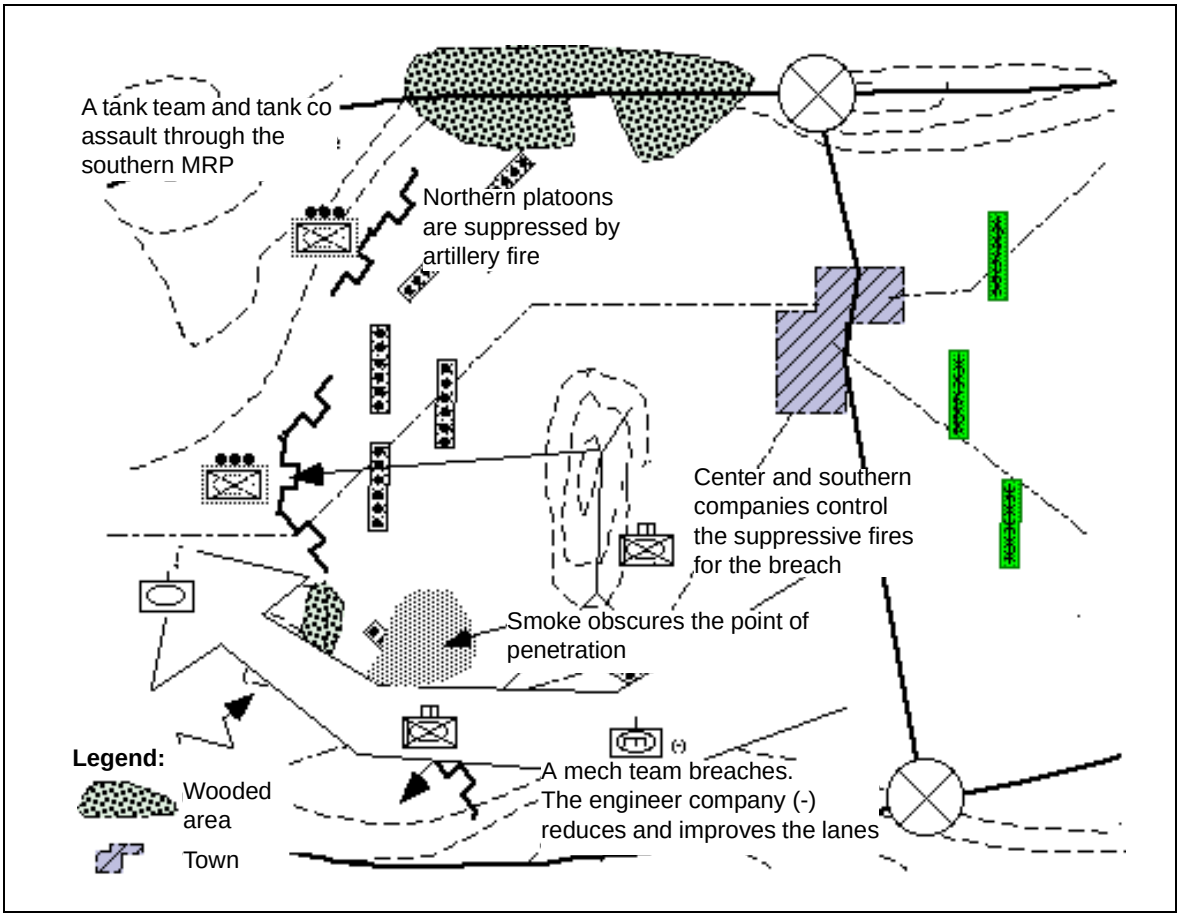

Figure 3-7. TF deliberate-attack execution

In the previous scenario, a FXXI TF would rely on its enhanced SA, breaching, precision maneuver, and C4I systems to pinpoint the enemy and strike before the enemy could effectively react. These capabilities enable the conduct of distributed operations over wider frontages with one less maneuver company than that discussed in the scenario. The engineer company commander would be the breach force commander with attached assets from the TF. The following are examples of this expanded capability:

A Grizzly crew of two will complete a breach that currently requires numerous soldiers in less-survivable systems. The Grizzly will incorporate both countermine and counterobstacle capabilities into a single system that can create a trafficable lane in one pass. Reconnaissance of the obstacles can be less detailed because the Grizzly will defeat all types of mine fuzing, fewer smoke rounds will be expended to obscure the point of penetration, and reduction time will be reduced. This eliminates the need of the TF and engineer commanders in the scenario to orchestrate a variety of reduction assets (for other than redundancy) to conduct the breaches. More importantly, it leaves the obstacle reduction to the engineer and allows the tanks used to push plows and rollers to return to the fight.

On order, the engineer company could reinforce the artillery-delivered obstacle with Volcano or Hornet Product Improvement Program (PIP) munitions to protect the TF's flank during the assault phase. Upon completion of the breach, the engineers use their FBCB2 systems to input and disseminate breach lane and bypass locations.

CHAPTER 4

DEFENSIVE OPERATIONS

This chapter deals with planning and executing the defense. It does not attempt to deal with all tactical issues facing the defending TF. It focuses on the interface that must be achieved to synchronize the engineer company into the TF's defensive preparations.

DEFENSIVE CHARACTERISTICS

To support the defense, the engineers must understand defensive characteristics and their relationship to engineer operations. Table 4-1, page 4-2a, highlights FXXI impacts to defensive characteristics. The characteristics of the TF's defense are—

- Preparation.
- Security.
- Disruption.
- Mass and concentration.
- Flexibility.

PREPARATION

Defenses have a distinct preparation phase. Engineer synchronization is vital to the TF's success. The engineer company is a critical component in setting the conditions for combat and giving the TF a decisive edge against the attacking enemy.

Engineer planning and preparation must not only provide a centralized focus for the defense but also allow for decentralized integration and execution. Engineer preparations in the defense are time-, manpower-, equipment-, and material-intensive. With no time to waste, the TF engineer must quickly identify engineer requirements. His dilemma is that the details of the TF plan will not be complete until the staff has time to conduct tactical planning and commanders have conducted personal reconnaissances. He must identify those requirements for survivability positions and obstacles that are not likely to change so that he can get engineers to work. As the plan matures, the TF engineer adjusts the supporting engineer plan through clear FRAGOs to his subordinates.

SECURITY

The defending TF provides security to conserve combat power for use elsewhere. The purpose of security in the defense is to coordinate and synchronize the defense, to provide early warning, and to disrupt the enemy attack early and continuously. The TF provides security through counterreconnaissance forces, deception, fortification, and protective-obstacle construction. The engineer company can emplace obstacles to support the counterreconnaissance screen and to disrupt the enemy's advance through the TF's sector.

DISRUPTION

The division and brigade attempt to disrupt the enemy's effort through deep, security, and deception operations. The TF fights as part of these operations. The engineer company constructs directed obstacles to disrupt the enemy forward of the EA and provides breaching capability to assist the TF during the fluid battle. The TF engineer plans and executes situational obstacles to disrupt follow-on enemy forces. Deception operations employ a combination of forces and obstacles to cause the enemy to commit forces prematurely against a falsely perceived weakness.

MASS AND CONCENTRATION

The TF seeks to concentrate its fires to exploit or create an enemy weakness. The engineer company supports the concentra-

tion of fires by constructing obstacles and fortifications and by providing mobility to counterattacks or reserve companies/teams. Obstacles are employed to directly attack the enemy's ability to maneuver. Tactical obstacles are integrated into the TF's direct-fire plan to enhance the terminal effects of those fires. Obstacles turn, block, fix, or disrupt the enemy's formations, allowing concentrated fires to create and exploit enemy weaknesses (see Figure 4-1).

The company also constructs fortifications as the TF emplaces protective obstacles, allowing the TF to survive the enemy's fires and break up his final assault. Defending from survivable positions is a key factor in maintaining concentrated fires until the enemy is destroyed. The engineer company provides mobility to the TF's counterattack or reserve, allowing the TF to exploit a broken enemy attack rapidly.

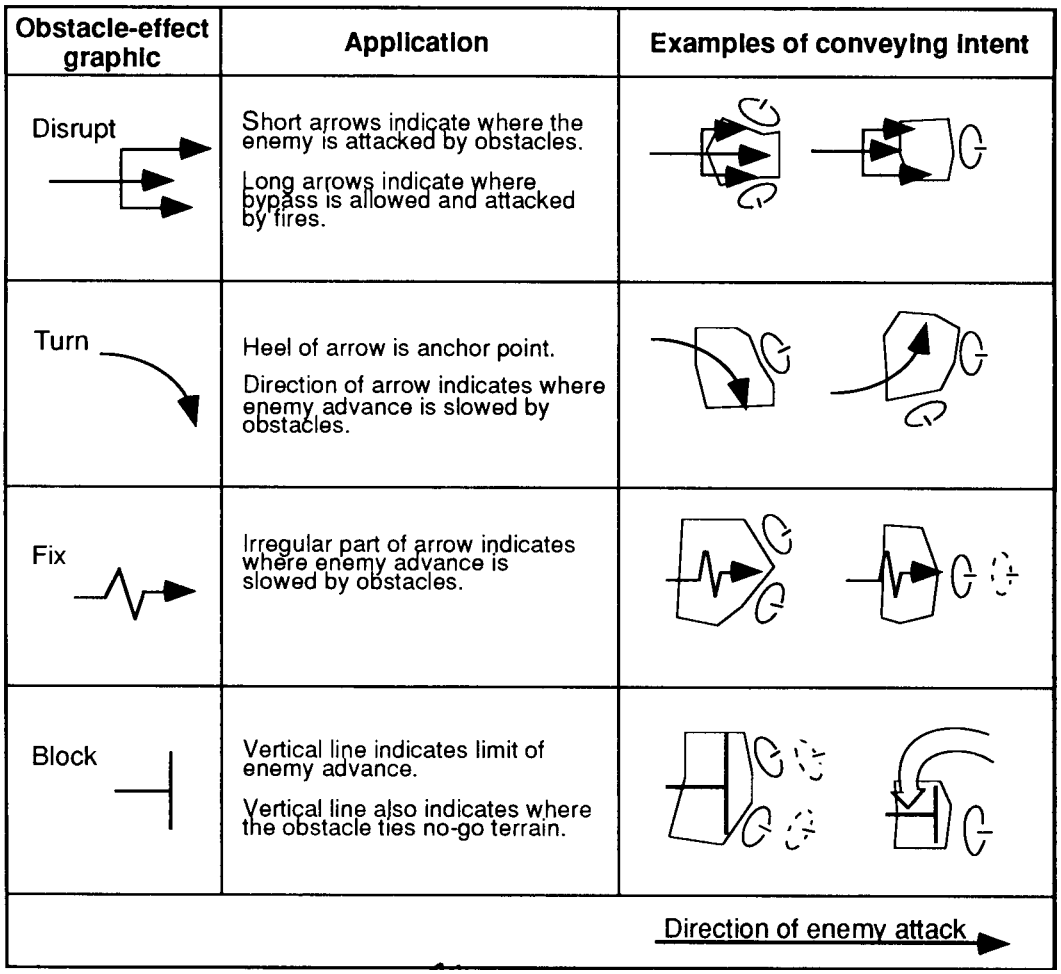

Figure 4-1. Obstacle-effect graphic

FLEXIBILITY

The TF must retain flexibility to counterattack or react to a deviation plan. Engineers assist the TF in maintaining flexibility through situational obstacles in the main battle area (MBA), task-organizing for rapid transition to the offense, and providing quick breaching capability for repositioning companies/teams. The engineers plan to use situational obstacles in the main EAs as "be-prepared (B/P) missions". Situational obstacles can be employed separately or can be used to reinforce existing obstacles in the EA.

Table 4-1. FXXI impacts to defensive characteristics

Defensive Characteristic	Impacts
Preparation	•Enhanced decentralized integration and execution •Automated tracking and planning of engineer requirements •Enhanced terrain visualization to identify survivability and obstacle requirements •Enhanced ability to conduct complete and parallel planning and BOS integration
Security	•Enhanced SA of battle space, enemy disposition, and friendly forces (near-real-time SA) •Simultaneous coordination and synchronization of the defense •Sensor munitions disrupt enemy attack, protect flanks, and protect unmanned battle space
Disruption	•Rapid obstacle-emplacement capability to attack enemy forward of EA
Mass and Concentration	•Enhanced C4I systems facilitate battle command, concentration of forces, obstacles, and fires
Flexibility	•Rapid adjustment and simultaneous dissemination of engineer plan through digital FRAGOs, updated graphics, and situation updates •Facilitated battle command and task-organizing for transition to the offense •Increased flexibility with ON/OFF sensor munitions

The TF engineer plans for the TF's mobility by preparing his company for the rapid breaching of enemy situational obstacles or friendly obstacles that impede the TF's offensive transition.

DEFENSIVE PATTERNS

There are two traditional defensive patterns: the mobile defense and the area defense. The fundamental difference between the two is their focus. The TF engineer must understand both defenses to effectively tailor his SOEO to support the TF commander's chosen pattern.

MOBILE DEFENSE

The mobile defense's focus is to destroy the enemy attacker. This defense is organized to allow the enemy to advance to a position where he can be destroyed by a counterattack or a large reserve. This defense trades space for time to achieve a decisive advantage against the attacker. Engineers concentrate on constructing obstacles to attack the enemy's freedom of maneuver and use mobility to preserve the strike-force reserve's mobility.

FBCB2 and navigational aids promote the flexibility required by FXXI units to conduct a mobile defense by enhancing SA and by providing rapid transmission of FRAGOs and the accompanying overlays. Hornet PIP gives the FXXI maneuver commander additional flexibility by enabling the munitions to be turned on and off as required or as directed.

Obstacle planning is linked to the most likely enemy COA rather than to a specific piece of terrain. Mobile-defense obstacle planning is more restrictive than permissive, and it reduces the flexibility of the companies/teams. This allows massed obstacle effort at areas that are crucial and preserves mobility for counterattacking forces.

Although adherence to obstacle-control measures has always been important, it will be paramount in the high tempo and fluid FXXI environment in which unit boundaries change dramatically and often throughout the expanded battle space. This also demands that the engineers tailor their use of Hornet PIP and situational obstacles to meet the mission requirements.

Survivability is also tailored to a force-oriented defense. The TF must fight the depth of its sector from multiple battle positions. Fortification efforts must support fighting quick engagements from multiple positions by providing primarily hull-down positions in both primary and subsequent battle positions. Protective-obstacle requirements are concentrated in the final subsequent positions where the penetration must be blunted to allow the counterattack.

The enemy is destroyed in the mobile defense by a large counterattacking reserve. The engineer company supports this reinforced company/team in two ways. First, the engineer company's obstacle-control measures ensure that the TF's obstacle efforts do not limit the mobile reserve's freedom to maneuver. Second, the engineer company ensures that the mobile reserve has the necessary dedicated engineer support to maintain mobility during the counterattack. The engineers that are a part of the counterattack must be able to counter the enemy's situational obstacles or reduce friendly obstacles as required by changes to the situation. The TF engineer must weigh the trade-off between the counterattack and the obstacle and survivability requirements of the TF's MBA when he allocates engineer forces, assets, and resources.

AREA DEFENSE

Area defense focuses on retaining terrain. The area defense is designed to absorb the enemy into an interlocking series of positions from which he can be destroyed. The interlocking nature of defensive fires, obstacles, and small, local reserves are the mechanism

for the enemy's defeat. The area defense does not focus on the outright destruction of the enemy, but on denying the enemy key terrain. Frequently in an area defense, the engineer company will concentrate on strongpoint preparation. This operation requires extensive materials and equipment and is characterized by extensive fortification and obstacle construction.

The SOEO focuses on retaining terrain and enabling the TF to concentrate fires from fixed positions. Locating and analyzing key and decisive terrain plays a major role in the organization of the area defense and becomes the focus of the obstacle and survivability effort.

The Hornet PIP munitions can be used in an economy of force or contribute to the direct-fire battle. They delay enemy movement and C^2 capabilities, disrupt enemy formations as they enter EAs, and influence enemy maneuver to set conditions for decisive combat operations. For more information on Hornet PIP tactical employment and planning considerations, see FM 20-32.

NOTE: The FXXI engineer's accessibility to the DTSS and terrain team at the brigade combat team (BCT) TOC provides him an automated capability to perform terrain analysis and receive digital topographic products within the timeframe required to support the TF mission.

The survivability effort must enable the companies/teams to concentrate fires from fixed positions. The TF engineer must be sensitive to increased fortification requirements. To fight from fixed positions, the companies/teams may require primary, alternate, and supplemental turret-defilade positions. The heavier survivability effort also requires a larger and more substantial protective-obstacle effort that breaks the enemy's final assault. The tactical-obstacle effort must be well-synchronized between the companies/teams to ensure mutual support and interlocking obstacle groups.

NOTE: The modern battlefield is seeing a shift from traditional static defensive positions to a mobile defense. Enemy thermal sights; top-attack multisensor smart munitions; precision-guided munitions (PGM); and dual-purpose, improved conventional munitions (DPICM) negate the camouflage effects of hull-defilade positions and provide little protection from such munitions. FXXI combat vehicles will leverage the SA gained from their advanced C4I systems to facilitate an effective mobile defense. The engineer main effort may shift from traditional direct-fire fighting positions to survivability of Q36/37 radar and CSS assets.

ENGINEER PLANNING FOR DEFENSIVE OPERATIONS

The TF engineer's role is to identify missions, allocate resources, and synchronize and command engineer functions. Countermobility and survivability are the engineer company's primary missions. Therefore, plann1ing for these missions are the TF engineer's initial essential tasks. FMs 90-7 and 20-32 cover in great detail the TTP for obstacle planning and integration.

The focus of defensive planning is to integrate and synchronize obstacles and fortifications into the TF's direct- and indirect-fire plans. This planning is directive and detailed in nature and focuses on the determination of obstacle groups and the type and amount of prepared positions. Actual obstacle siting and emplacement and position locations are the purview of the company/team commander and the supporting engineer platoons.

TF-level defensive planning is part of the tactical decision-making process. The EBA process provides the basis for integrating defensive planning with the decision-making process.

ANALYZE THE MISSION

The key activities during the mission analysis are to—

- Determine facts and assumptions.
- Analyze relative combat power.
- Analyze the engineer battalion's/brigade's mission and the commander's intent.
- Issue the commander's guidance.

DETERMINE FACTS AND ASSUMPTIONS

Defensive planning starts with the receipt of a mission to defend. The company XO and/or the TF engineer and the S2 begin by developing a SITEMP. The modified combined obstacle overlay (MCOO) is a product developed during the IPB process as a joint effort of the engineer and intelligence sections of the TF's TOC.

The MCOO should define the AAs and mobility corridors within the TF's AO. This information is vital to obstacle planning. Obstacles are placed on AAs to attack enemy maneuver. The AA analysis also details potential EAs. The MCOO also highlights areas where fortification is not feasible because of soil type, terrain restrictions, or limited fields of fire. It also indicates where forces can defend with limited survivability construction because the reverse slope or undulating terrain provides natural concealment and cover.

The threat evaluation and enemy COA development detail how the enemy will potentially attack. They also provide an insight as to what and where the enemy's objective and routes might be. The SITEMP helps the engineer to understand how the enemy will traverse through the TF's sector and allows the engineer to gain an understanding of how and where he can best attack the enemy's maneuver.

The SITEMP also depicts how an enemy's reconnaissance force will enter the sector. This is especially important to reconnoiter obstacle and fortification efforts.

The engineer must articulate the current capabilities of the engineer company, its current combat power, and its ability to support the TF. Assumptions on future capability or potential reinforcement by other engineers should be analyzed. Specific characteristics of special engineer equipment and SCATMINE systems are detailed for the staff. An initial Class IV/V supply-point location and operation plan should be developed with the TF staff (note that the TF has responsibility for Class IV/V supply-point operation). The XO/1SG works with the TF and the engineer battalion S4 to ensure that delivery of Class IV/V barrier material is synchronized with the execution.

ANALYZE RELATIVE COMBAT POWER

The engineer compares friendly and enemy combat power and identifies possible obstacle and fortification requirements that offset potential enemy breaching and direct- and indirect-fire capabilities. The actual inclusion of the obstacles normally occurs after COA development. During this phase, the engineer finishes his EBA to gain an understanding for the engineer company's ability to support the TF.

ANALYZE THE ENGINEER BATTALION'S/ BRIGADE'S MISSION AND THE COMMANDER'S INTENT

The staff analyzes and identifies information from the engineer battalion/brigade order and commander's intent that will potentially impact defensive planning. An engineer analyzes the maneuver brigade and engineer battalion commanders' intent to determine potential obstacle placement, obstacle intent, and construction priority based on his concept of the operation. If not given in the higher order, the engineer must determine the intent for the obstacle belts in the higher order as well as the fortification priority.

The TF must identify tasks and limitations imposed from the brigade OPORD. These

might include obstacle belts with or without specific intents, obstacle-restricted areas, or restrictions on the type of obstacles. Also, the brigade OPORD might specify reserve, situational, or directed obstacle groups or the minimum level of survivability.

The engineer must identify a TF's total obstacle and fortification capabilities. Available assets include engineer units, SCATMINE systems, and infantry units that can provide additional manpower for obstacle construction. Engineer equipment status and work rates must be considered. Appendix D details the engineer company's defensive planning factors. Time must also be considered.

ISSUE COMMANDER'S GUIDANCE

A TF commander should be as specific as possible with his initial obstacle and fortification guidance. If the commander narrows the COA focus, he may also provide obstacle or fortification guidance. His guidance is a key factor in an early start and must be solicited if not offered.

COURSE-OF-ACTION DEVELOPMENT

Detailed planning begins following the COA development. The engineer focuses on five specifics in his SOEO for the defensive plan, including—

- Direct-/indirect-fire analysis.
- Obstacle-intent integration.
- Obstacle priority.
- Fortification priority.
- Mobility requirements.

DIRECT-/INDIRECT-FIRE ANALYSIS

The direct-/indirect-fire analysis examines how engineers can best use obstacles (within the commander's intent) to enhance the direct-/indirect-fire plan. The COA sketch includes the minimum maneuver graphics for the staff to plan. Fire-control measures indicate where and how the TF's direct-fire weapons mass, shift, or lift to destroy the enemy. The staff should annotate direct-fire weapons-range fans on this overlay to gain an appreciation of the direct-fire coverage. This analysis can be used to formulate obstacle locations with the direct-fire plan. The engineer must have a fundamental understanding of the direct-/indirect-fire and maneuver plans and the TF's organization of the EA to effectively integrate obstacles with the direct-/indirect-fire plan.

The direct-fire plan also illuminates which companies/teams will require fortification based on their position with respect to the terrain. The engineer must understand the purpose of each company/team to determine its fortification requirements. Synchronization of direct and indirect fires with obstacles multiplies the relative effect on the enemy. An obstacle is an excellent location for preplanned artillery and mortar fires. These fires can eliminate dismounted breaching efforts. The indirect fires contribute to the threat's ability to breach, making the obstacle more effective and providing direct-fire systems a higher probability of kill.

The TF staff uses DTSS terrain-visualization information acquired from the engineer battalion to ensure that the obstacle overlay is synchronized with direct-/indirect-fire plans. The weapons range fan depicted in Figure 4-1a, page 4-6, is an example of a DTSS product.

OBSTACLE-INTENT INTEGRATION

The engineer determines locations for the directed obstacle groups. Groups are placed on the COA overlay to support the maneuver plan. This location is for planning only and normally will be adjusted after the ground reconnaissance.

Obstacle groups target specific enemy elements based on the SITEMP. The engineer generally allocates an obstacle group against a battalion-sized AA. This approach mirrors the staff's placement of a company/team against the same enemy force. The company's/team's fire responsibility drives the placement of the obstacle groups.

The engineer advises the commander on which specific effect each directed obstacle group must achieve. He plans obstacle groups to—

- Disrupt the enemy.
- Turn the enemy into an area where friendly units can mass fires.
- Fix the enemy in the EA and enhance his direct-fire destruction.
- Block the enemy from using an AA.

The engineer integrates directed obstacle groups with the COA. The obstacle effects are shown on the COA overlay using obstacle-effects graphics. The engineer draws the obstacle-group graphic to reflect the location, target, and specific intent of the group as accurately as possible. The engineer should visualize the terrain and how it naturally effects maneuver. Terrain visualization is vital to proper obstacle-group design.

OBSTACLE PRIORITY

The staff determines the priority of each group depicted on the overlay. Priority is established by the commander's intent and the most likely enemy COA. The obstacle priority should reflect the TF's greatest obstacle requirement. The primary obstacle effort can be with an economy of force where the commander needs more obstacles to overcome a shortage of direct-fire systems. The TF engineer should be cognizant of flank protection, weapons types and ranges, and the overall commander's intent for the entire force before placing obstacle priority on the main EA. Priorities assist the engineer XO in allocating resources and ensuring that the most critical obstacle groups are emplaced first.

FORTIFICATION PRIORITY

The SITEMP, the fire analysis, and the purpose of each company/team provide insight to

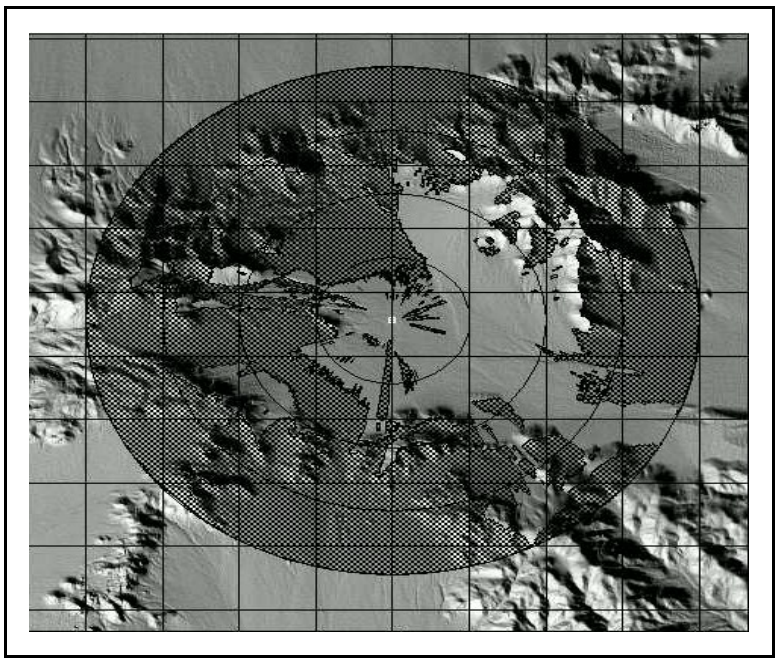

Figure 4-1a. DTSS terrain product—direct-fire weapons range fans

Soil conditions and weather must be considered, along with the equipment capability, to determine the potential number of positions that can be constructed. A company serving as a counterattacking force does not need the survivability effort that a blocking team needs. Soil conditions or terrain could preclude fortification. All of the above must be considered to analyze the TF's fortification potential.

MOBILITY REQUIREMENTS

The engineer identifies the TF's mobility requirements. Obstacle groups should not be arrayed along potential counterattack routes or where there is a potential to hamper unit repositioning. Mobility assets should be used to counter potential enemy situational obstacles and friendly obstacles that might hinder friendly maneuver. The TF engineer must consider the commander's mobility requirements and plan for mobility assets to be ready when and where needed. For example, if the commander has a tank company positioned to attack the enemy's flank, the engineer must ensure that the company can get to the flank. This can be done through planned lanes or obstacle-restricted areas or by placing breaching assets with the company to provide critical mobility and immediate response to enemy situational obstacle threats. Hornet PIP munitions will give the commander enhanced mobility capability. The engineers have the ability to turn the Hornet munitions off as friendly forces transit through the obstacle system. Once all friendly forces are through, the Hornets can be turned back on, completing the obstacle system's integrity.

COURSE-OF-ACTION ANALYSIS

The staff war-games the COA to determine its viability and to determine the best COA to recommend to the commander. The engineer refines the SOEO during this process as well. Obstacles and fortifications should be considered within the context of the maneuver COA. Some specific areas that the engineer staff officer should consider are—

- Enemy reactions at the obstacle groups (breaching or bypassing capability) versus the desired obstacle effect.
- Enemy breaching capabilities that make one obstacle type preferable to another (such as a tank ditch versus a minefield).
- Obstacle locations that hinder friendly maneuver.
- The compatibility of obstacle effects and weapons-systems capabilities.
- Adequate direct-/indirect-fire-control measures, as well as targeting that supports the obstacle effect. Effects of artillery and obstacles must be synchronized to gain the desired effect on the enemy's maneuver.
- Locations of suspected enemy artillery concentrations that make one type of fighting position preferable to another.
- Locations and types of enemy situational obstacles that make one type of breaching asset preferable to another.

The staff adjusts the COA after war gaming, including the obstacle and fortification plan, as follows:

- Obstacle-group location changes.
- Obstacle-effect changes.
- Additional situational-obstacle groups.
- Additional reserve-obstacle groups.
- Fortification effort, type, or priority changes.
- Identification of other mobility requirements.
- Refinement of artillery targets based on obstacle group changes.

MOBILITY REQUIREMENTS

The staff determines which obstacles require lanes and the closure criteria for these lanes.

They also determine obstacle-restricted areas that support the TF's maneuver. Lanes and bypasses are determined using tactical repositioning requirements developed during the COA analysis. Requirements for rehearsal movement, TRP placement, and logistical support of forward TF elements are also considered in lane development. Mobility requirements identified during COA development are synchronized and refined during COA analysis. Additional mobility requirements identified during war gaming are resourced and planned for.

OBSTACLE DESIGN AND RESOURCING

After the COA analysis, the engineer conducts a detailed study of the obstacle plan to determine the resource requirement. Groups are resourced using the width of the mobility corridor and the resourced factors from Table 4-1a. The size of the mobility corridor is determined from the MCOO. The corridor width multiplied by the resource factor will give a resource allocation for that corridor and effect. The TF engineer resources the obstacle groups based on their assigned priorities. Once the engineer has developed the resource requirements for the obstacle groups, he plans the individual obstacles within the group.

If time permits, a detailed ground reconnaissance of the obstacle-group location can be conducted. This will allow a more detailed analysis of the obstacle requirement for that AA, and then individual obstacles can be planned by the engineer. However, usually the engineer will only designate the intent to guide the companies/teams. The company/team commanders and their supporting engineers will complete the actual design of the individual obstacles within the obstacle groups.

Table 4-1a. Resource factors

Minefield	Resource Factor
Disrupt	0.5
Fix	1.0
Turn	1.2
Block	2.4

DECISION AND EXECUTION

The engineer makes adjustments to the SOEO based on the COA that the commander approves. The engineer then provides either an oral, written, or graphical order with sufficient detail to allow the subordinate units to conduct the operation. The engineer provides the following critical information using the—

- Scheme-of-obstacle overlay.
- Obstacle-execution matrix.
- Survivability matrix and time line.

SCHEME-OF-OBSTACLE OVERLAY

The scheme-of-obstacle overlay depicts the location of the TF's obstacle groups, brigade-directed obstacle groups (if any), and obstacle belts within the TF's sector. The overlay also includes any obstacle restrictions dictated from a higher headquarters. The overlay depicts the obstacle groups using the standardized obstacle-effect symbols shown in Figure 4-1, page 4-2. The overlay does not generally show individual obstacles unless the engineer has had sufficient time to conduct a thorough ground reconnaissance where exact obstacle locations have been identified. The engineer must exercise extreme caution if he uses individual obstacles on the overlay. He must ensure that inexperienced leaders do not attempt to emplace obstacles exactly as shown on the overlay, but instead, properly site the obstacle with the company/team commander. The TF scenario presented later depicts an example of a TF scheme-of-obstacle overlay. The scheme-of-obstacle overlay graphically depicts how the commander seeks to influence enemy maneuver through obstacles.

FXXI units use their FBCB2 to provide the platoon leaders a digital obstacle overlay

depicting obstacle groups and intent graphics. The emplaced obstacles automatically replace the intent graphics in the digital overlay as they are emplaced. The platoons must digitally send an updated obstacle overlay to the CP showing actual obstacle locations. This updated overlay is then coordinated with the S3 to ensure that the plan meets the commander's guidance, and with the FSO or the fire-support team (FIST) to ensure that the indirect-fire plan supports the obstacle plan. Figures 4-1b and 4-1c, page 4-8b, shows FBCB2 digital overlays with obstacle groups and intent graphics.

OBSTACLE-EXECUTION MATRIX

The obstacle-execution matrix includes specific instructions and detailed information concerning the obstacle groups shown on the scheme-of-obstacle overlay. Figure 4-2, page 4-9, shows a directed-obstacle-execution matrix.

A directed-obstacle-execution matrix should include the following information:

- The zone/belt/group designation and individual obstacle numbers, to include situational obstacles.
- The location.
- The obstacle effect for the group.
- The priority of the group.
- The emplacing and owning unit.
- Locations of lanes or bypasses.
- Lane-closure responsibility and closure resource location.
- The material allocation or assets allocated to the group.
- The Class IV/V supply-point responsibility.
- The location of obstacle materials and Class IV/V supply-point locations.
- Any special instructions, such as triggers or firing-party procedures.
- Obstacle repair instructions.

SURVIVABILITY MATRIX AND TIME LINE

The survivability time line includes specific instructions and detailed information concerning the TF's fortification effort. Normally, the A&O platoon leader controls the equipment and ensures that fortification construction is complete according to the survivability matrix and time line. The A&O platoon leader uses his digital C^2 systems to designate way points to assist in controlling movement from the fighting positions to their next assigned task. He is the TF engineer's primary agent for construction during defensive preparation. As a minimum, these prod-

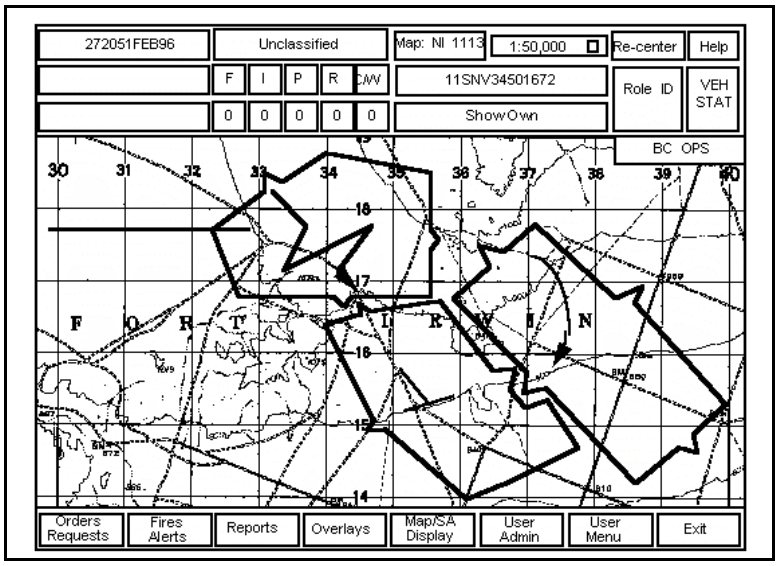

Figure 4-1b. FBCB2 obstacle groups and intent graphics overlay

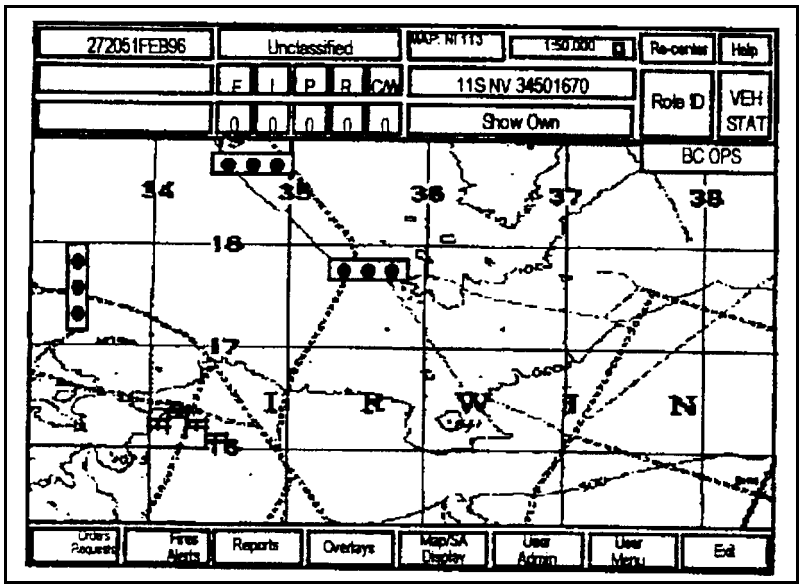

Figure 4-1c. Sample FBCB2 obstacle overlay

ucts should include the following information (see Figure 4-3, page 4-11):

- The survivability priority for the type of position and the type of system.
- The company/team priority.
- The number, type of position, and time allotted to fortify each TF element.
- The location.
- The allocation of equipment.
- The maneuver point of contact (POC) with each element, including the call sign and frequency.
- Any special instructions, such as disengagement triggers, follow-in construction tasks, or equipment rally points.

The FXXI engineer uses his FBCB2 to develop and send the platoon leader a fortification plan, survivability matrix, and time line to support the COA. SOPs and special considerations must be developed to coordinate engineer support with echelons above division (EAD) and non-FXXI units working in the AO. For example, one special consideration is to use a single blade coordinator for EAD engineer blade assets that may or may not have digital interface with the maneuver unit they support. FXXI units are responsible for providing non-FXXI units comprehensive SA. This is critical since the EAD engineer units will provide the majority of the survivability effort within the BCT's AO. Table 4-1b, page 4-10, depicts digital enhancements for engineer planning of defensive operations.

NOTE: The tracking of enemy position/location data is critical to the maintenance of a common enemy picture. In the defense, FBCB2 will normally be the source of communication used to provide enemy intelligence data until contact is established. FBCB2 operators must be aware that an enemy icon is not generated in FBCB2 unless a SPOTREP or contact report is transmitted. Once this is done, the battalion/brigade S2 will input the enemy icon and it will appear on the operator's FBCB2 display.

TASK-FORCE OBSTACLE SCENARIO

The following is a scenario that highlights some considerations for defensive planning at the TF level:

The TF commander has the mission to defend in sector to defeat an enemy regiment. Based

Zone/Belt/ Group/ Obstacle Number	Location	Effect	Priority	Emplacing Unit	Owning Unit	Lane Location	Lane-Closure* Responsibility	Materials/Assets Required	Materials Location	Special Instructions
A1A	NK 312568	Turn	1	A 78 Engr	A-1/63 AR	N/A	N/A	1200M15	NK 310568	
A1B	NK 315002	Fix	3	1/B 78 Engr	B-1/63 AR	N/A	N/A		NK 315002	
A1C	NK 311085	Block	2	2/B 78 Engr	C-1/63 AR	NK 311082	Scouts V63AR	360-can. Volcano	NK 311085	Volcano 48-hour duration. Approved by corps commander

*Reference to reserve-obstacle-execution matrix

Figure 4-2. Directed obstacle-execution matrix

on the TF's mission, the commander directs the staff to develop a COA (see Figure 4-4, page 4-12). The scouts will screen forward. Teams A and C and Company D defend from battle positions (BPs) A, C, and D, respectively, to mass direct and indirect fires in EA Dog. Team B defends along a secondary AA in the south from BP B. On order, Team B repositions to a subsequent BP to support the fight in EA Dog.

The engineer develops an obstacle plan to support the COA. First, he analyzes the fire plan to determine the areas where fires are massed to destroy the enemy. He sketches in rough range fans based on the probable weapon systems in each BP. These areas suggest locations where they can integrate obstacles with fires (see Figure 4-5, page 4-12). The engineer selects locations for directed obstacle groups. He confines the obstacle-group locations to obstacle belt A1, which was identified during mission analysis. He uses obstacle-effects graphics to show the relative location of the obstacle groups and to indicate the desired obstacle effect. The obstacle groups target enemy battalion-size formations (see Figure 4-6, page 4-13). The engineer coordinates with the FSO to ensure that indirect fires are planned to support and reinforce the desired obstacle effect. Finally, the TF engineer sets priorities for the obstacle

Table 4-1b. Digital enhancements to engineer planning for defensive operations

Engineer Defensive Planning	Digital Enhancements
Analyze the Mission	•Accessibility to DTSS/terrain team support and products, TF MCS, and ASAS information accelerates the IPB/EBA process by providing responsive and accurate terrain and enemy information (improve SITEMP) •Automated unit status and asset tracking helps to gain an understanding for the engineer company's ability to support the TF
Course-of-Action Development	•Enhanced C4I systems facilitate parallel planning and BOS integration to ensure that the SOEO supports the maneuver COA •DTSS helps visualize the battle space, the terrain's effect on the maneuver COA, and possible enemy maneuver corridors. It provides a quick digital recon of the AO
Course-of-Action Analysis	•Digital war-gaming capability •Automated obstacle design and resourcing to support COAs
Decision and Execution	•Digitally adjusts and disseminates SOEO (obstacle overlay and control measures) based on the approved COA

PLANNING BELOW TASK-FORCE LEVEL

The following sections outline the principles for siting tactical obstacles and fighting positions to support the company/team. The focal point is the coordination that must occur between the emplacing unit leader (normally an engineer platoon leader) and the company/team commander. This coordination is probably the most vital component of effective obstacle and fortification integration. It is at this level that units directly integrate obstacles and fortifications with the effects and capabilities of weapons and the fire plan. Once the coordination is complete, the emplacing unit physically sites the obstacle and fighting positions with the company/team.

COORDINATING WITH THE MANEUVER COMMANDER

Effective coordination with the company/team commander, who is responsible for the obstacle group, is essential to making the obstacles a combat multiplier. The emplacing engineer is the company/team commander's "team engineer" for the mission. The engineer and the company/team commander work closely to ensure complete integration of obstacles with the company/team plan.

The emplacing engineer and company/team commander use a common set of information when coordinating. The following tools and information will improve coordination:

- The SITEMP.
- The commander's intent, including the unit's task and purpose.
- Maneuver graphics and the fire plan.
- The obstacle-execution matrix.
- The scheme-of-obstacle overlay.
- The fire-support plan.
- CSS graphics.

It is the emplacing unit's responsibility to accurately plot the obstacle locations on an updated digital overlay. This updated obstacle overlay should be sent to the maneuver and engineer commanders at higher headquarters.

During coordination, a checklist is used for organizing thoughts and formulating questions. Table 4-2, page 4-16, provides a checklist of some of the considerations used during coordination between the emplacing engineer and the company/team commander. These considerations are organized using the BOSs to provide a logical framework.

At the completion of each facet of planning or as new information becomes available, the XO ensures that each platoon leader updates his FBCB2 overlay. Coordination via face-to-face contact or FBCB2 is conducted with adjacent units and BOS elements to establish communication and to eliminate gaps and dead space between the units. FBCB2 will enhance and expedite planning and assists coordination with adjacent units and other BOS.

NOTE: Both voice and digital communications systems have their limitations and both can be disrupted. As a result, TF and company SOPs must clearly define and prioritize when voice and digital communications will be used so voice and digital contention is minimized.

SITING THE OBSTACLE

The emplacing engineer and the company/team commander site individual obstacles to achieve synchronization between the obstacle effect and fires. Both must devote sufficient time to the siting effort. It represents the final adjustments to both obstacle location and fire control before emplacement.

To site individual obstacles, certain preconditions are necessary. First, the company/team

commander decides where he plans to mass fires and marks the necessary fire-control measures on the ground. The location of these control measures must be clear since they are the basis for obstacle siting. Second, the commander identifies tentative locations for his key weapons within his position or sector. Finally, he and the engineer must both understand the obstacle group's intent.

Obstacle siting concentrates on marking the obstacle group as a whole instead of marking each individual obstacle. However, it may be easier to site individual obstacles in broken terrain. The company/team commander and emplacing engineer use vehicles or soldiers from the company/team, the engineer platoon, or both to simulate the enemy force and do the physical marking. The simulated

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Table 4-2. Obstacle coordination checklist

BOS	Considerations
Intelligence	• Enemy AAs and MCs (mounted and dismounted) • Likely enemy COAs and possible reactions to obstacles • Enemy breaching capability • Enemy reconnaissance routes, friendly counterreconnaissance or R&S plans, company/team-level patrols • Likely enemy formations and transitions between formations
Maneuver	• Higher commander's intent • Type of weapons and locations • Sectors of fire/location of TRPs and how they are identified • Mobility requirements for adjacent units, CATK axis, routes for repositioning, employment of reserves, and passage of lines • Obstacle-protection measures
M/S	• Obstacle intents (target, location, and obstacle effect) • Integration of obstacles and fires • Obstacle-control measures and restrictions from higher HQ • Obstacle marking to prevent fratricide • TF mobility requirements (lanes and gaps) • Mutual support between the obstacle location, the fire plan, obstacle effects, and survivability positions
Fire support	• Artillery or mortar targets • Priority targets, what type, and final protective fires • Plan for covering obstacle effects with indirect fires • Indirect-fire-control measures to synchronize direct and indirect fires and obstacles • Fire-registration plan (deconflict with obstacle emplacement) • Fire support if enemy contact occurs during emplacement • ADAM/RAAMS use (lane closure and repair breached obstacles)
Air defense	• Location of the enemy air AAs during emplacement • Update on changes to air-defense warning and weapons-control status • Location of air-defense systems that can cover engineers emplacing obstacles • Method of obtaining and disseminating early air-defense warning
CSS	• Tentative location of the Class IV/V supply point within the company/team position, if used, and routes from the supply point to obstacles • Routes the company/team plans to use to conduct LOGPAC operations • Manpower assistance and material-handling equipment at the Class IV/V supply point
C^2	• Location of commander during defensive preparation • FM net of the supported company/team and means of communication • Unit boundaries affecting obstacle emplacement • Time and place of company/team order • Coordination that must occur with adjacent units • Obstacle reporting and recording requirements • Time and method of obstacle turnover • Lane-closure responsibilities and procedures • Company/team understands obstacle intent

enemy forces move into the EA to the enemy side of the obstacle group. The engineer platoon leader and the company/team commander collocate near the weapons covering the obstacle. As a technique, one or all of the tanks, Bradleys, or other crew-served weapons may occupy their position and contribute to the siting process. All participants in the siting process use a common frequency-modulated (FM) net to communicate during siting.

The simulated enemy forces move into the EA, simulating the enemy's attack. They deploy into a formation of similar frontage as the expected enemy formation. Once they are near the marked fire-control measures, they place markers at intervals as they drive the trace of the obstacle-group effect (or individual obstacles in broken terrain). They remain oriented on key fire-control measures to ensure that obstacle location and effect are synchronized with fires. During the process, each participant verifies that he can cover the obstacle, notes the location of fire-control measures and obstacles, and records the appropriate data on range cards. As the platoon drives the obstacle trace, siting participants also identify dead space and requirements to refine the location of obstacle group and fire-control measures. The siting process may also identify the need for other fire-control measures. Figure 4-9 illustrates how the engineer and the company/team commander work together to site a turn obstacle group.

Once the company/team marks the general limits and orientation of the obstacle group, the engineers can begin marking individual obstacles (if not already done). To mark individual obstacles, the engineer platoon uses the group markers as a guide. As shown in Figure 4-9, the group markers may lend themselves well as the start and end points of individual obstacles; however, this is not always the case. As the engineer platoon refines the group limits into the site of individual obstacles, the platoon can then begin the necessary site layout based on the method of obstacle emplacement.

Siting is not the last thing done during preparations. The time and resources involved in emplacing tactical obstacles require that siting begin concurrently with establishing the defensive position. It is imperative that the unit sites the obstacles as soon as the

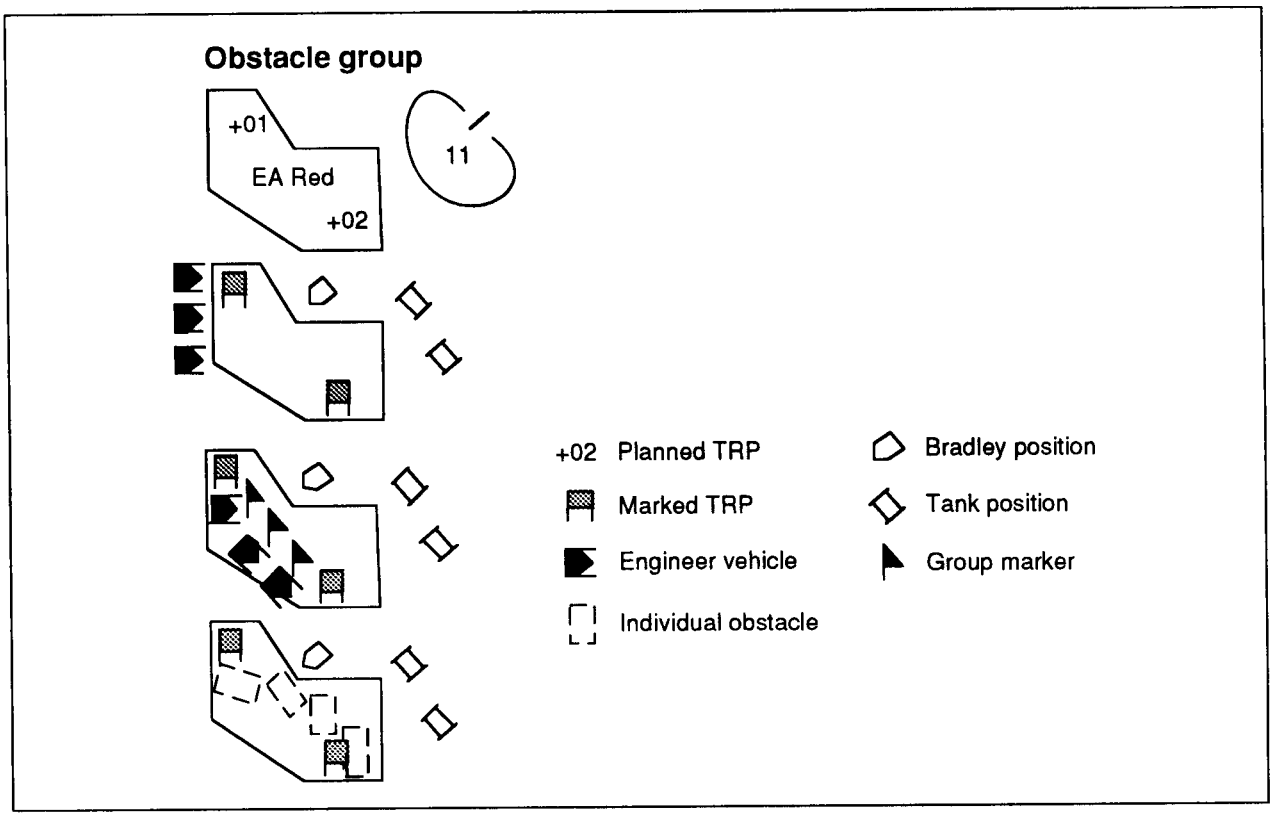

Figure 4-9. Sample obstacle-siting turn-obstacle group

company/team commander has established the EA and identified tentative positions for key weapons. It is not necessary that all weapons be in place and dug in before siting. Normally, well-marked fire-control measures and one known position per maneuver platoon (not dug in) is all that is required to effectively site the obstacles.

OBSTACLE TURNOVER AND TRANSFER

Once an obstacle group is completed, the emplacing unit conducts obstacle turnover with the owning unit. Occasionally, an owning unit will transfer responsibility for an obstacle to another unit. Obstacle turnover or transfer ensures that the commander of the owning unit is familiar with the obstacle and understands his responsibilities concerning the obstacle. The following are some considerations for obstacle turnover and transfer:

- Briefing on local friendly and enemy situation.
- Description of the obstacle, including location, type, marking, and composition.
  - — Conventional minefields: type of mines, fuzing, and AHDs.
  - — Scatterable minefields: type of mines, duration/self-destruct time, and safety zone.
  - — Other obstacles (booby traps and other hazards).
- Information on lanes, including number, locations, marking, and closure plan, or information on the reserve obstacle (if applicable).
- Coordination completed or still required with the fire-support team.
- Transfer of graphics and documentation (minefield records, demolition target folders, and orders for the demolition guard, or other written records).
- Guidance on obstacle-protection measures taken or required (counterreconnaissance, targeting enemy breachers, obstacle repair, or phony obstacles).
- Conducting an obstacle turnover with a non-FXXI unit.
- Procedures for turnover of Hornet PIP.

NOTE: When conducting an obstacle turnover with a non-FXXI unit, the FXXI unit is responsible for providing situational and location data.

More detailed information on obstacle turnover can be found in FM 20-32.

SURVIVABILITY PLANNING

The A&O platoon leader must coordinate with the company/team commander in a similar fashion as his line-platoon counterpart. The company/team must first position his direct-fire systems before the A&O platoon leader can direct his equipment to begin construction. Caution must be exercised to prevent this construction process from starting before the systems have been sited in. If the systems have not been positioned, there is a risk that the construction effort will not be in the proper place, wasting valuable time and effort.

After the A&O platoon leader understands where the company/team will place their systems, he can direct his equipment to start work. The FXXI engineer platoon leader acquires a FBCB2 overlay, which defines—

- Company/team control measures.
- Routes and checkpoints to fighting positions.
- The location of each primary, alternate, and supplementary firing position.
- Company/team trigger points.
- TRPs and EAs.

NOTE: FBCB2 overlays can become cluttered if too much information is placed on the overlay. This makes the overlay unreadable and unusable. If necessary, a second operational overlay should be prepared.

The A&O platoon leader must monitor the construction effort and keep the engineer informed of his progress. This information is critical for the staff to monitor defensive preparation and will allow them to make informed recommendations to the commander if changes in priority are required. The FXXI platoon leader can submit FBCB2 reports to the company team commander and engineer company related to the progress (time-line completion) of the survivability effort. The TF must have a SOP for proper reporting procedures (methods, responsibilities, and time lines) and the flow of survivability support updates. If both the company/team and the engineer unit report the information, it may result in confusion and inaccurate battle tracking.

The A&O platoon leader, maneuver platoon leaders, and combat/section leaders must ensure that the direct-fire systems can see the EA, TRPs, and obstacles once the positions are completed as shown in Figure 4-10. They should immediately inform the company/team commander if they discover a potential problem with this. The A&O

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CHAPTER 5
OTHER TACTICAL OPERATIONS

There are several other tactical operations that the engineer company could be involved with. These include retrograde, passage-of-lines, breakout, linkup, river-crossing, and heavy/light forces operations; military operations on urbanized terrain (MOUT); and contingency operations. See Appendix E for formation examples.

RETROGRADE OPERATIONS

A retrograde operation is an organized and controlled movement of forces toward the rear or away from the enemy. Retrogrades are organized to economize forces, create or maintain freedom of maneuver, or avoid decisive combat. The engineer company participates in a retrograde as part of a larger force, typically a battalion/TF.

TYPES OF RETROGRADE OPERATIONS

There are three types of retrograde operations: delays, withdrawals, and retirements. Delays trade space for time, preserve the force, or avoid decisive engagements. Withdrawals break contact with the enemy to conduct other missions. Retirements move the unit to the rear when not in enemy contact.

Delay

A delay is an operation in which the TF trades space for time. The TF must not become decisively engaged. It must emphasize force preservation and mobility maintenance to be successful. The TF may attack, defend, or conduct ambushes to destroy the enemy or slow his forward progress. The TF may delay as the covering force of a larger unit or as an economy-of-force operation that allows others to attack. To control an enemy penetration, the TF could delay, allowing others to counterattack.

A delay's basic concept is to retain freedom of maneuver while forcing the enemy to deploy repeatedly against successive battle positions. Engineers support the delay by attacking the enemy's freedom of maneuver with obstacles and bridge and road destruction. The engineer company builds fortifications that allow the TF to deploy successfully to protected positions. The engineer company's priority is to ensure that the TF can quickly disengage and move to subsequent battle positions.

Maximum use of terrain must be made to protect the force effectively and to gain the maximum effect from obstacles. Obstacles must be used to reinforce natural choke points and existing obstacles. They must slow the enemy's use of high-speed AAs and force him to deploy repeatedly and use his organic breaching assets. Slowing the enemy's forward progress is essential to gain time for the TF to disengage (see Figure 5-1, page 5-2). The use of FBCB2 augments the C^2 tools needed by the engineer company commander to conduct the delay. He obtains updated enemy SA and operations overlays from the TF, then adds company graphics to control the movement and positioning of his platoons.

Withdrawal

A withdrawal is an operation in which the TF breaks contact with the enemy to conduct another mission. There are two types of withdrawals: in enemy contact and not in enemy contact. Both begin with the TF in enemy contact; however it is preferably made without heavy enemy interference.

A withdrawal not under enemy pressure depends on speed and deception. The engineer company primarily assists the TF by ensuring that it can rapidly overcome any threat to mobility. Engineers help with deception by building false fighting positions and dummy obstacles and by unit activity. Obstacles are normally employed to cover the TF as it breaks contact. Artillery-delivered

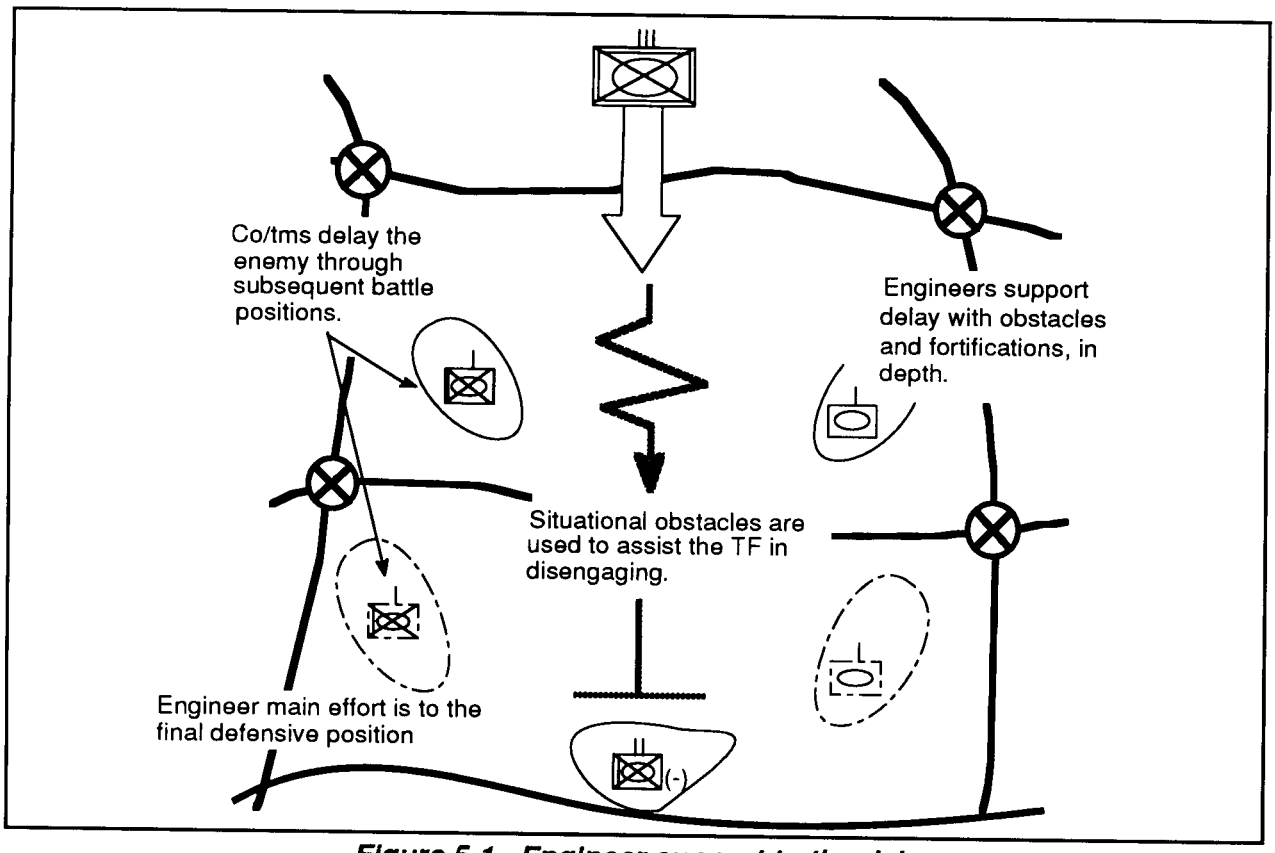

Figure 5-1. Engineer support to the delay

minefields are emplaced on stationary enemy forces or on suspected enemy AAs to delay the enemy's approach. Fortifications are not normally constructed in a withdrawal not under enemy pressure.

A withdrawal under enemy pressure uses firepower and maneuver to break contact with the enemy. Engineer reconnaissance is critical to determine where and what assistance the engineer company must render to the TF to ensure its mobility. Obstacles and fortifications are planned and developed to allow the TF to move to subsequent battle positions until contact can be broken with the enemy. Maximum use of situational obstacles must counter the enemy's maneuver, allowing the TF's rear security element to disengage and break contact. The engineer-emplaced obstacle groups must assist the TF in stopping, disorganizing, or reducing the enemy's ability to pursue effectively. The engineer company must focus its mobility assets quickly, overcoming any enemy remotely emplaced obstacles, battlefield debris, or other impediments to mobility.

Retirement

A retirement is a retrograde operation where the TF *is not in contact* and moves to the rear in an organized manner. This operation is normally conducted at night. A retirement may have an adverse impact on the engineer company's morale. It is imperative that the commander maintain positive leadership and keep his company briefed on future operations and intentions of the chain of command.

The engineer company commander should anticipate a change in task organization during a withdrawal, unless the entire force withdraws. Normally, if only one TF withdraws, the engineer company will be task-organized with another unit in contact or anticipating contact with the enemy. Normally, the TF will retire as part of a larger force.

CONSIDERATIONS FOR RETROGRADE OPERATIONS

All retrogrades are risky and inherently dangerous. They must be well-organized and well-executed to succeed. There are four major underlying considerations in planning and executing retrograde operations. They are—

- Leadership and morale.
- R&S.
- Mobility.
- Battlefield deception.

Leadership and Morale

Leadership and morale are essential for maintaining the offensive spirit. The engineer leaders in a retrograde operation must ensure that soldiers have confidence and do not perceive the retrograde as a preliminary to defeat. The engineer commander must ensure that his soldiers know their purpose and role in the retrograde.

Reconnaissance and Surveillance

The TF must locate the enemy to deny him information about the TF's disposition and to counter the enemy's efforts to pursue, outflank, isolate, or bypass the TF or any of its elements. The TF normally constitutes a security force that is strong enough to secure the enemy AAs; to defeat enemy intelligence-collection efforts; to overwatch retrograding units; and to provide rear-guard, flank, and choke-point security.

The engineer company supports the security force through the construction of obstacle groups that limit the enemy's maneuver, lane closure, situational-obstacle emplacement to protect the security force, and hasty fortification that affords the security force additional protection.

Mobility

The engineer company's primary mission in a retrograde operation is ensuring that the TF can quickly complete the retrograde. Engineers improve the TF's mobility by—

- Conducting route reconnaissance.
- Positioning mobility assets at critical points.
- Improving routes and providing guides through friendly obstacles along the retrograde routes.
- Rehearsing lane closure, situational-obstacle emplacement, and movement.
- Acquiring, treating, and medically evacuating casualties rapidly.
- Evacuating recoverable supplies and materials and excess equipment before the retrograde.
- Displacing nonessential company assets early in the operation.

Engineers degrade the enemy's advance by—

- Constructing obstacles at choke points or on routes not used by the TF.
- Fortifying construction for forces occupying key terrain that dominates high-speed AAs.
- Destroying roads, bridges, and rafting on avenues not required by the TF.
- Improving existing obstacle groups with conventional or SCATMINE systems.
- Planning situational obstacles to delay and disrupt the enemy's maneuver.

Deception

Deception targets the enemy force to cause indecision and to delay the enemy attack. It is essential to the retrograde's success. Engineers must ensure that their preparations do not give away the TF's intention. Dummy obstacles, deception fortification, equipment

movement, and camouflage can all be used as part of the TF's deception efforts. Situational obstacles are normally planned but not executed until required. This ensures that the TF's deception plans are not compromised by premature obstacle emplacement.

PASSAGE OF LINES

A passage of lines is an operation where the TF moves through another unit. Passages of lines are characterized as either forward or rearward. The considerations for the engineer company are similar and differ only if the TF is stationary or passing. The major considerations for the engineer company are the exchange of information between passing engineers and the passing force's mobility. Coordinating instructions may be found in the TF's digitized OPORD or FRAGO or may be issued over the radio. FM-voice traffic is kept to a minimum and digital communications are emphasized. **NOTE: Digital overlays which depict preselected checkpoints, routes, AA locations, and stationary vehicle locations should be transmitted from the stationary force to the moving force to simplify the coordination process and speed passage.** The company, if part of the stationary TF, assists in the control of the passage, particularly in regard to the passage of any emplaced obstacles.

The SA provided by the FBCB2 will assist in the C^2 of the passage of lines. For example, FBCB2 provides near-real-time location information of friendly obstacles and the moving force through the automatic update process the FBCB2 provides. **NOTE: The time between the refresh rate or update rate for SA on the vehicles depends on the selected setting made in the FBCB2. This rate should be set by the unit SOP to ensure that everyone has the same SA picture at all times.**

Passage control between the passing and stationary TFs is a key consideration in a passage of lines. Normally, both TFs' TOCs will collocate. This allows both engineer company CPs to also collocate. Collocation allows both CPs to control the engineer passage and exchange scheme-of-obstacle overlays and allows the passing engineer company the necessary information required to assume control of the obstacle effort in sector.

Both engineer companies must jointly plan and closely coordinate to ensure the passage's success. They exchange information that includes individual obstacle locations and their markings, situational obstacles planned, cleared routes through the sector, and standards for lane marking. Details of reserve obstacles and situational-obstacle triggers and execution criteria are also exchanged.

The stationary TF is responsible for the passing TF's mobility. The stationary engineer company normally provides guides through existing obstacles and positions breaching assets to move the passing TF through quickly. In a rearward passage, the stationary engineer company is prepared to close obstacle lanes after the passage of the rearward moving unit (see Figures 5-2 and 5-3).

The passing TF generally organizes for in-stride breaching before starting its passage. The passing force must be prepared to breach enemy remotely delivered mines rapidly during passage as well as breach any friendly obstacles that do not have lanes. **NOTE: Creating lanes through the stationary unit's obstacles requires permission from the stationary force and should only be done in extreme situations.** Authority to reduce obstacles may be delegated to subordinate units of the passing force in the coordinating instructions of the brigade OPORD. Any breaching required or undertaken by the passing force must be reported so that the stationary unit can repair the obstacle. This is especially important during a rearward passage of lines.

BREAKOUT OPERATIONS

A breakout is an operation performed by a bypassed or encircled TF. The TF conducts a breakout to regain freedom of maneuver or to regain contact with friendly units. Encirclement does not imply that the TF is surrounded by strong enemy forces (see Figure 5-4, page 5-6).

Regardless of initial command/support relationships, all forces encircled become attached, including the engineer company with the TF. The TF organizes for the breakout with four forces: the rupture force, the reserve force, the main body, and the rear guard.

Engineers support the breakout in a similar fashion as they would a deliberate breaching operation. The engineer company organizes

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LINKUP OPERATIONS

The TF will conduct a linkup as part of a larger force. The engineer planning considerations are similar to those of the passage of lines. The engineer must carefully plan situational obstacles so that their execution will not interfere with the linkup operation. Also, the linkup may require the moving force to breach obstacles emplaced by the stationary force.

Digital systems are used to facilitate linkup operations through the sharing of SA information related to the force's position and location, linkup points, the enemy situation, and control measures. Linkups are inherently dangerous missions, as the friendly forces must pass through the enemy to establish the linkup. Obstacle-control measures must be established and rigidly enforced.

The forces digitally or manually coordinate the following information: known enemy situation; type and number of friendly vehicles; disposition of stationary forces (if either unit is stationary); routes to the linkup point; fire-control measures; near recognition signal; finalized location for the linkup point; and any special coordination, such as maneuver instructions or requests for medical support. This information should be transmitted via digital or conventional overlays to the actual linkup.

Tracking the linkup element through the FBCB2 will provide near-real-time location information. If both units are moving, the headquarters that controls the units designates the control measures required to ensure safe linkup. If one unit is stationary, the moving unit moves to and through the linkup point at a predetermined location. **NOTE: Special communication procedures may be necessary to allow the linkup elements to communicate with one another digitally (for example, an exchange of internet protocol addresses and codes) if not of the same parent organization or if one of the units is analog.**

RIVER-CROSSING OPERATIONS

There are three types of water crossings that can be conducted by a battalion/TF: hasty, deliberate, and retrograde. Hasty crossings are done by the TF with its organic assets. Hasty crossings normally include fording, crossing on existing bridges, and swimming vehicles. The engineer company assists in hasty crossings by improving fords, emplacing armored vehicle-launched bridges (AVLBs) or heavy assault bridges (Wolverines) at critical crossing sites on the river (based on DTSS information), and providing a thorough crossing-site reconnaissance.

The TF participates in deliberate or retrograde river crossings as part of a larger force. FMs 90-13 and 71-2 provide detailed explanations for planning these operations. Generally, the TF organizes for in-stride breaching during these operations to facilitate rapid transition through the crossing area.

The TF approaches a hasty water crossing in much the same way as an in-stride breaching operation. FM 71-2 details the following characteristics of a hasty crossing:

- Speed, surprise, and a minimum loss of momentum.
- Decentralized operations with organic, existing, or expedient resources.
- Weak or no enemy defenses on both banks.
- Minimum concentration of forces.
- Quick continuation of the operation.

The engineer company provides AVLBs/Wolverines (when equipped) to cross relatively narrow gaps. The AVLB/Wolverine can also

be used to improve river bottoms for fording. The Wolverine is capable of spanning a 24-meter gap and possesses M/S equivalent to supported forces. The engineers can also improve both entrance and exit banks for the TF with the ACE.

HEAVY/LIGHT FORCES OPERATIONS

The engineer company must prepare to support, and be supported by, light forces in a variety of situations. An armored or mechanized TF could receive a light infantry company for both offensive and defensive operations. Normally, the light forces will augment the armored or mechanized TF during operations in restricted terrain. Similarly, the engineer company could be augmented by a light engineer platoon or squad. Finally, the engineer company, or one of its subordinate elements, could be task-organized to support a light infantry brigade. There is an overlap of situations where both heavy and light engineers can operate. The integration of heavy and light engineers capitalizes on the enemy's force structure to attack its weakness and then seize the initiative (see Figure 5-5, page 5-8).

SUPPORT TO A LIGHT INFANTRY COMPANY ATTACHED TO A TASK FORCE

The light infantry company offers the TF commander unique capabilities in both the offense and the defense. However, with those unique capabilities comes a corresponding set of requirements for engineer support.

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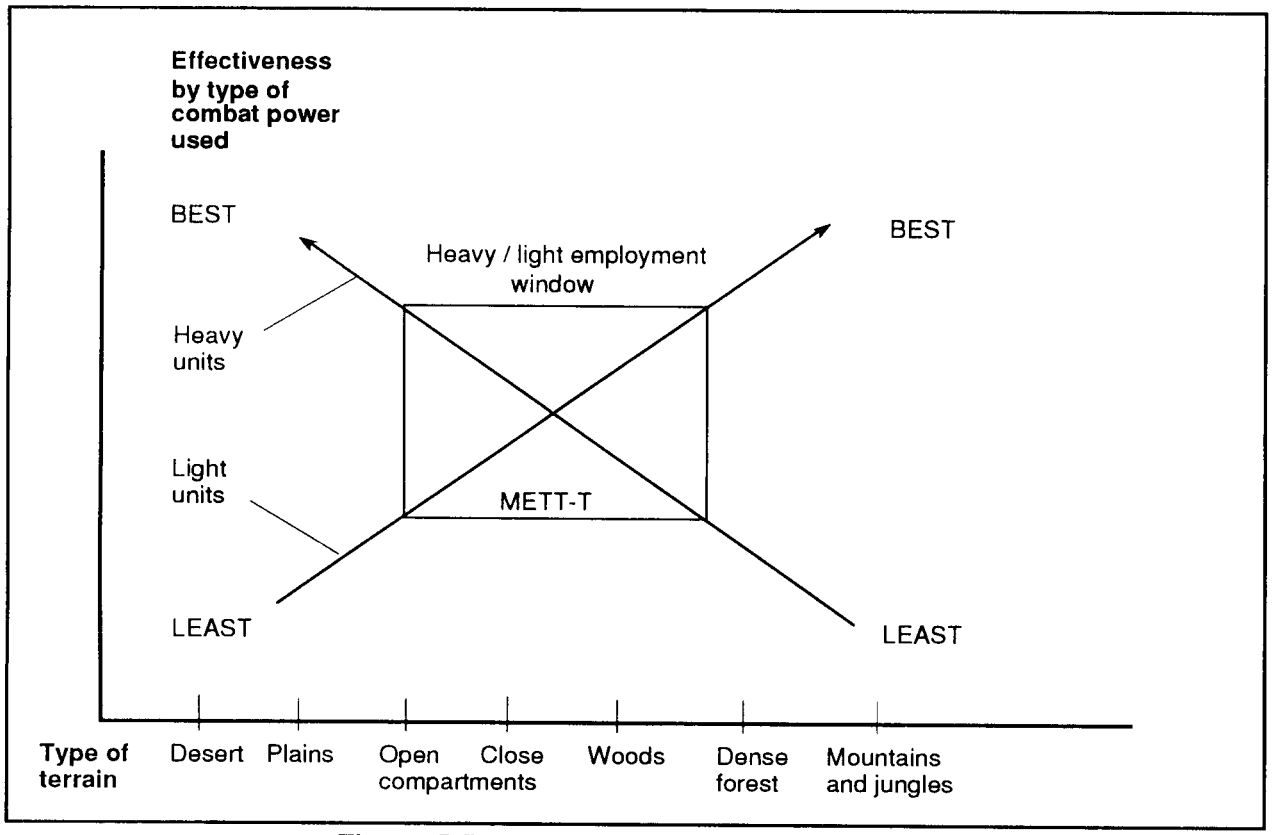

Figure 5-5. Heavy/light employment window

Normally, a light infantry company attached to an armored or mechanized TF will not have any light engineers. The TF engineer must be aware of the distinctive requirements and capabilities of the light infantry company. He must also plan and allocate engineer assets to provide optimum support to the TF as a whole.

Defense

In the defense, light infantry forces will normally defend in restrictive terrain. Obstacles in restrictive terrain will usually be point obstacles emplaced in depth to support antiarmor ambushes. In less restrictive terrain, the light infantry forces will normally be employed in strongpoints integrated throughout the defense. These light infantry strongpoints are ideal for providing anchor points for turning or blocking obstacle groups.

Regardless of the type of terrain, obstacles must support the capabilities of the light infantry company. The light infantry company has few antitank (AT) weapons and must destroy enemy vehicles from within small-arms ranges using flanking and rearward fires. Obstacles must be constructed so that flanking fires from the light force can stop the enemy and force him to dismount to breach.

The light infantry force will also require substantial fortification for sustained combat. The TF engineer must plan for providing mechanical digging assets for the preparation of individual and crew-served weapon positions. The TF engineer must also plan to allocate and transport hand tools, construction materials, and obstacle materials to allow the light infantry to build and improve their own fortifications and to construct protective obstacles.

Offense

In the offense, light infantry forces fight best in restrictive terrain. If employed in less

CHAPTER 6

COMBAT SERVICE SUPPORT

CSS begins at the engineer company level. The engineer company has an organic supply section. All other CSS is under the engineer battalion's control. The battalion has the burden of logistics support.

In FXXI units, all CSS is received from the base support company (BSC) of the FSB located in the brigade support area (BSA). Within the BSC is an engineer support element (ESE) that consists of fuel, food service, and maintenance personnel dedicated to supporting the companies within the engineer battalion. Additional CSS assets from the BSC come from its maintenance, forward repair, and supply and transportation platoons (see Figure 6-1, page 6-1a). Combat health support (CHS) is provided by organic medics located in the engineer battalion headquarters and headquarters company (HHC), by combat lifesavers (CLS) within the various engineer platoons, and by integrating with the TF for medical evacuation.

An engineer support area (ESA) is an area from which corps engineer assets (combat mechanized, wheeled, CSE, bridge, combat heavy, and so forth) stage and where their supporting maintenance (organic and DS) reside. The same applies to EOD and any other units that are part of the engineer-force task organization. The headquarters for the ESA is the engineer battalion administrative logistics operations center (ALOC) and the engineer battalion HHC (see Figure 6-1a, page 6-1a). The ESA will include a distribution node for corps throughput used by corps engineers and possibly division engineers. The ESA will include a multi-unit UMCP to maintain all vehicles (division and corps) in the engineer-force task organization. This ESA may be part of a wider brigade forward support area.

Like maneuver battalions, the engineer battalion may not place C^2 or other assets in the BSA or with the FSB headquarters except when dictated by METT-TC. Corps engineer units working in the BSA will normally execute the FSB engineer function under the control of the division engineer battalion. In cases when there is no EAD engineer force, the division engineer battalion may establish an engineer battalion ALOC (-) with responsibilities as an engineer logistical liaison center and carrying out brigade rear engineer duties.

The engineer company's CSS responsibility is to report and request logistics requirements and to ensure that the supplies and support provided arrive at the company and are properly executed. The XO and 1SG normally perform these functions. They send the personnel and logistics reports and other required information and requests to the rear.

SUPPORT OF FXXI OFFENSIVE OPERATIONS

In planning for the sustainment of FXXI offensive operations, the priority is to maintain the momentum of the attack. A successful attack may develop into exploitation or a pursuit, and the XO and 1SG must be flexible enough to support either contingency. The following considerations apply to CSS planning for offensive operations in support of the digitized engineer company:

- Establish criteria for using FBCB2 logistics reporting.
- Position the engineer battalion S1/S4 ALOC in the BSA to ensure continuous digital communications, while maintaining adequate security and defensive measures.
- Specify the conditions when the automated medical evacuation (MEDEVAC)

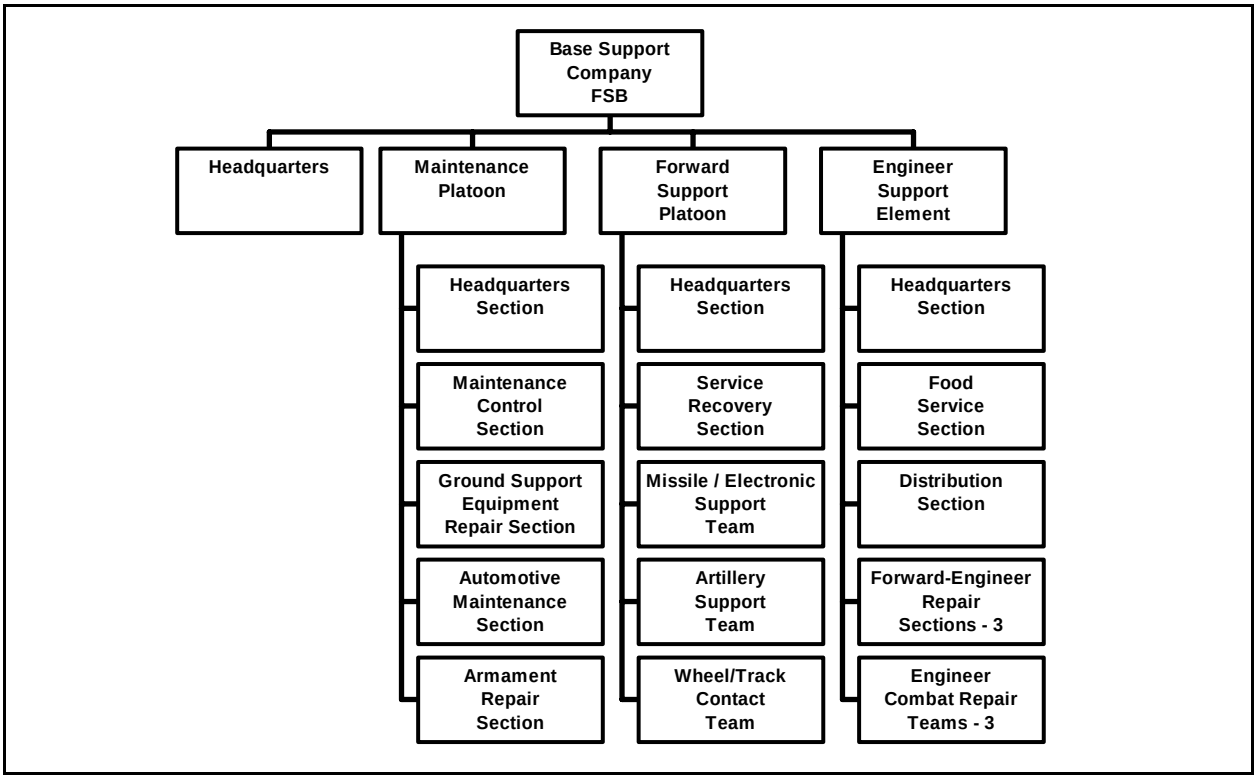

Figure 6-1. Brigade support company organizational chart

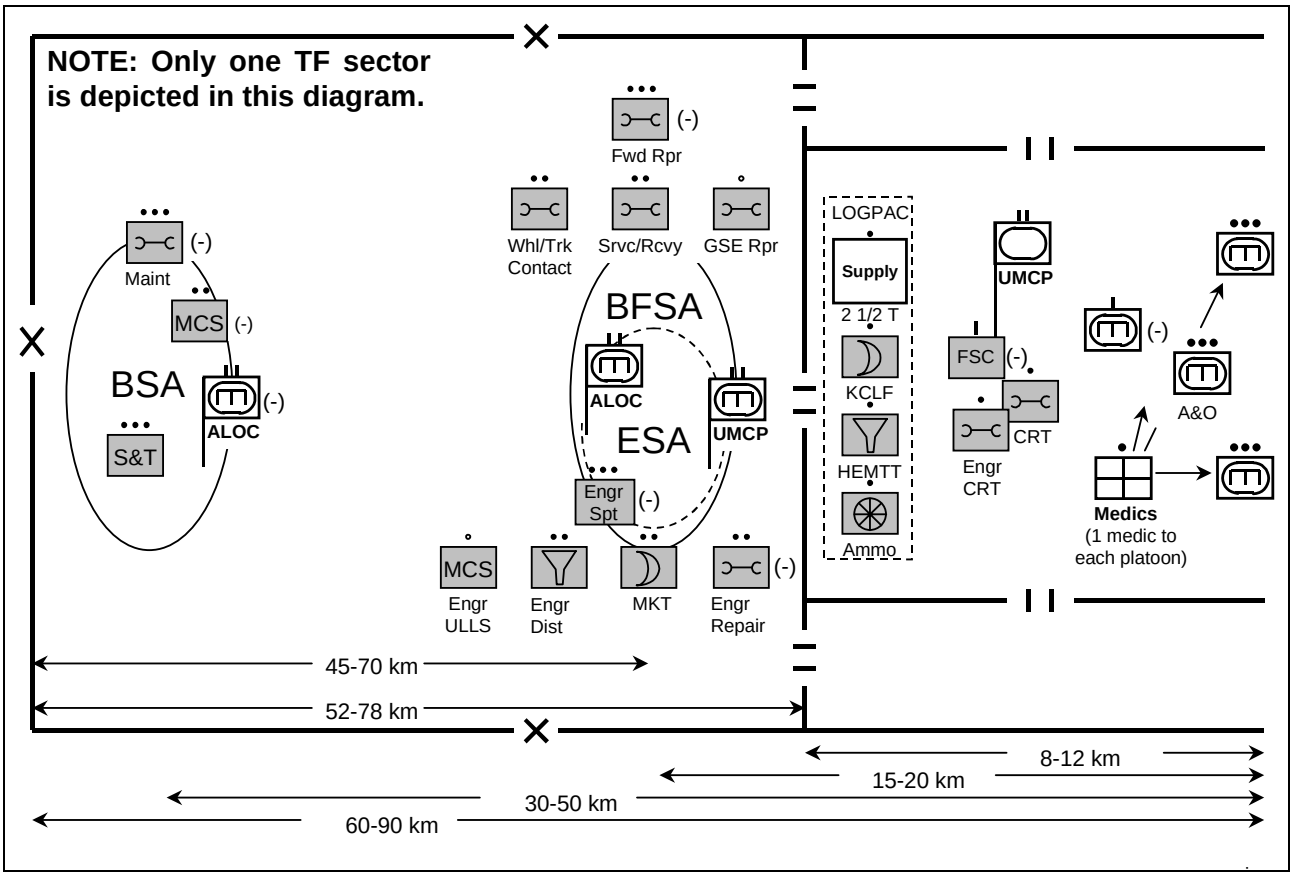

Figure 6-1a. ESA located in brigade forward support area

report in casualty evacuation operations.

- Request the pre-position of high-use line replacement units (LRU) forward with the engineer combat repair team (CRT).

A major product of the offensive planning process is the CSS overlay (see Figure 6-1b). The battalion S4 and/or HHC commander prepares both the traditional acetate overlay and an FBCB2 equivalent. When the FBCB2 operations overlay is received from the company CPs, the BSC support operations officer, in coordination with the engineer battalion S4, enters the CSS graphics and control measures. These typically include proposed BSA locations, primary and alternate main supply routes (MSRs), ambulance exchange points (AXPs), and the class of supply-point locations. Due to limitations inherent in the automated symbol set, the FBCB2 CSS overlay makes extensive use of checkpoints to represent supply points, AXPs, LRPs, and MSRs.

SUPPORT OF FXXI DEFENSIVE OPERATIONS

The most critical time for CSS operations in the defense is during the preparation phase. The engineer company must make maximum use of limited-visibility resupply to disguise friendly-unit activity and to exploit the improved navigational capabilities and SA of

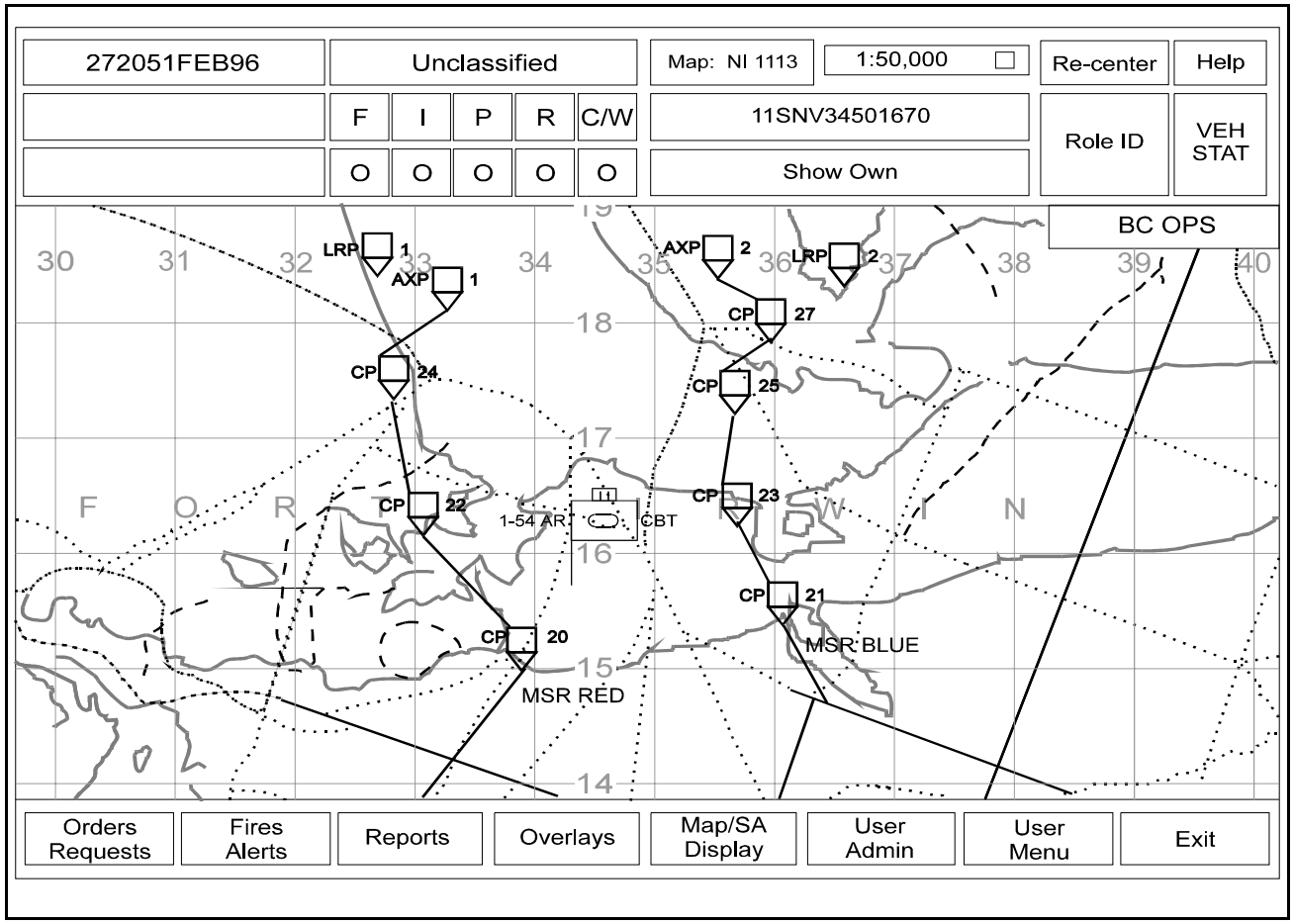

Figure 6-1b. FBCB2 offensive CSS overlay

FBCB2 forces. Planning considerations for defensive operations are similar to those outlined for the offense, with the following additions:

- Anticipate the amounts and types of engineer specific ammunition; petroleum, oil, and lubricants (POL); and barrier material for delivery to centrally located LRPs and prestock locations.
- Anticipate and plan for increased transportation cargo-hauling capacity that will be generated by the engineers for Class IV/V supplies in the defense.
- Conduct resupply operations during periods of limited visibility to reduce opportunities for enemy interference.
- Use embedded diagnostics to troubleshoot and repair vehicles forward in designated positions. These measures include the self test (ST), built-in test (BIT), and fault-isolation test (FIT) on the Grizzly, Wolverine, and ESVs.

Planning considerations for developing a FBCB2 CSS overlay in support of the defense are similar to those discussed earlier for offensive operations. CSS overlays include locations of prestocks and routes to and from designated LRPs (see Figure 6-1c).

CSS MESSAGES AND MESSAGE FLOW

The logistics situation report (LOGSITREP) provides input for logistical status reporting for Classes I, III (package [P] and bulk [B]), IV, V, VII, and limited VIII. The LOGSITREP primarily flows through the NCO chain of command to the engineer battalion

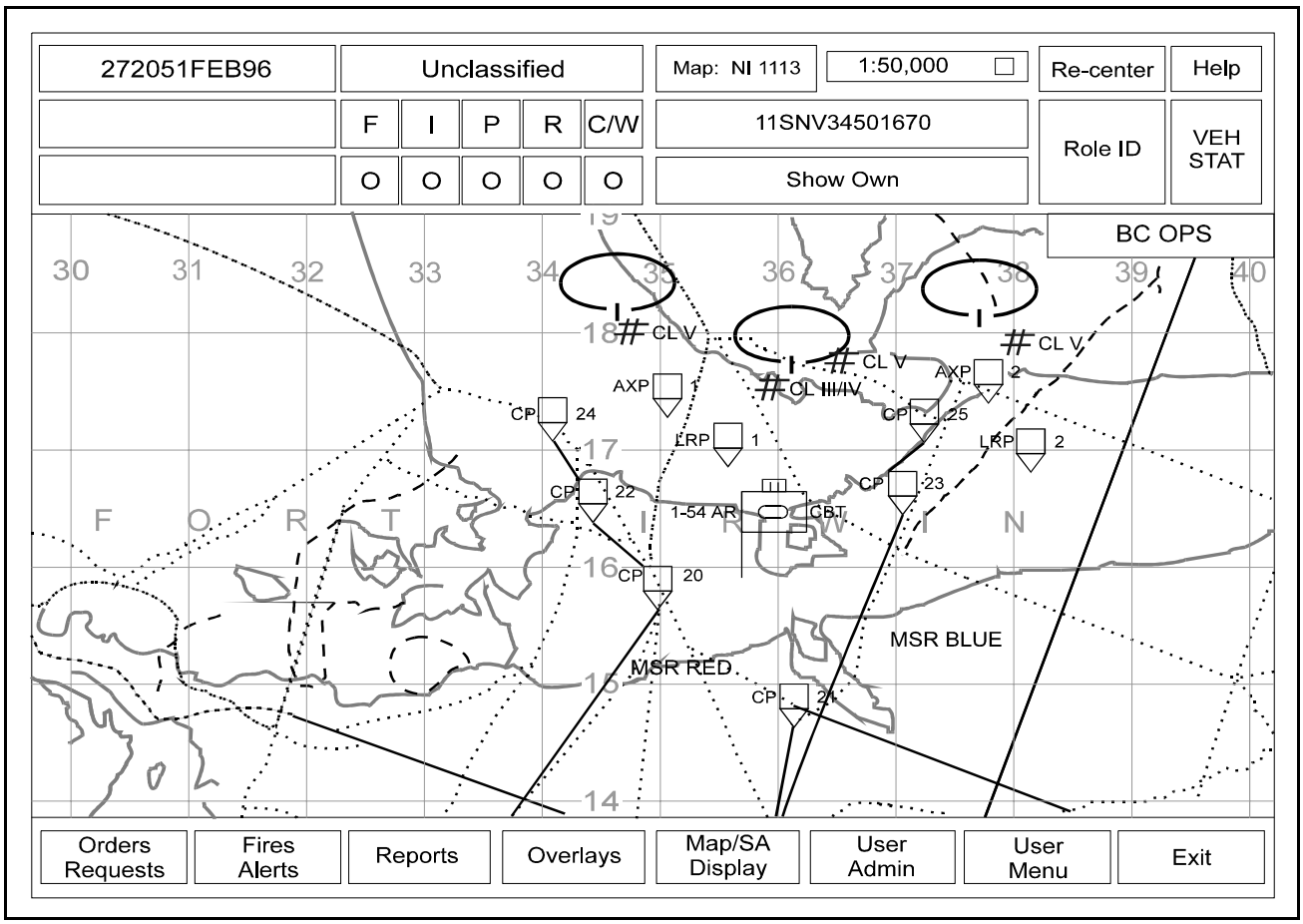

Figure 6-1c. FBCB2 defensive CSS overlay

S4 and the supported maneuver brigade S4, with information copies to the FSB and BSC support operations sections. All reports will follow the chain of command as specified in the unit task organization (UTO). As each unit's report is submitted to the next higher echelon of command, information copies are sent to key personnel. For survivability of the reporting process, key personnel are identified to replace the primary roll-up-point duties should the primary roll-up-point become non-operational. At brigade level, the maneuver brigade S4 submits company-level roll ups to the Combat Service Support Control System (CSSCS).

All recipients of the LOGSITREP (action or information message) have the ability to look down one level of command (see Figure 6-1d). This gives that user the ability to see the report submitted at that level for each class of supply and any comments that were made. Comments made with the LOGSITREP cannot be rolled up. Any comments necessary for further processing up the reporting chain must be reentered in the next report

The purpose of the LOGSITREP is to provide the unit commanders and key personnel visibility of the latest logistics status of their unit. A secondary purpose of this report is to provide the CSS unit visibility of the engineer unit's logistics status to better anticipate the company's logistics requirements. Optimally, the engineer company will not have to request resupply of commodities reported through this report because the CSS unit is aware of their requirements and can begin the necessary CSS action prior to the company requesting it.

LOGISTICS CALL FOR SUPPORT

Any platform with a FBCB2 can request CSS support through the logistics call-for-support (CFS) message function. The CFS is a templated message and may be sent directly to the supporting logistics activity, but should be sent to the engineer company 1SG. This enables immediate support action on the bat-

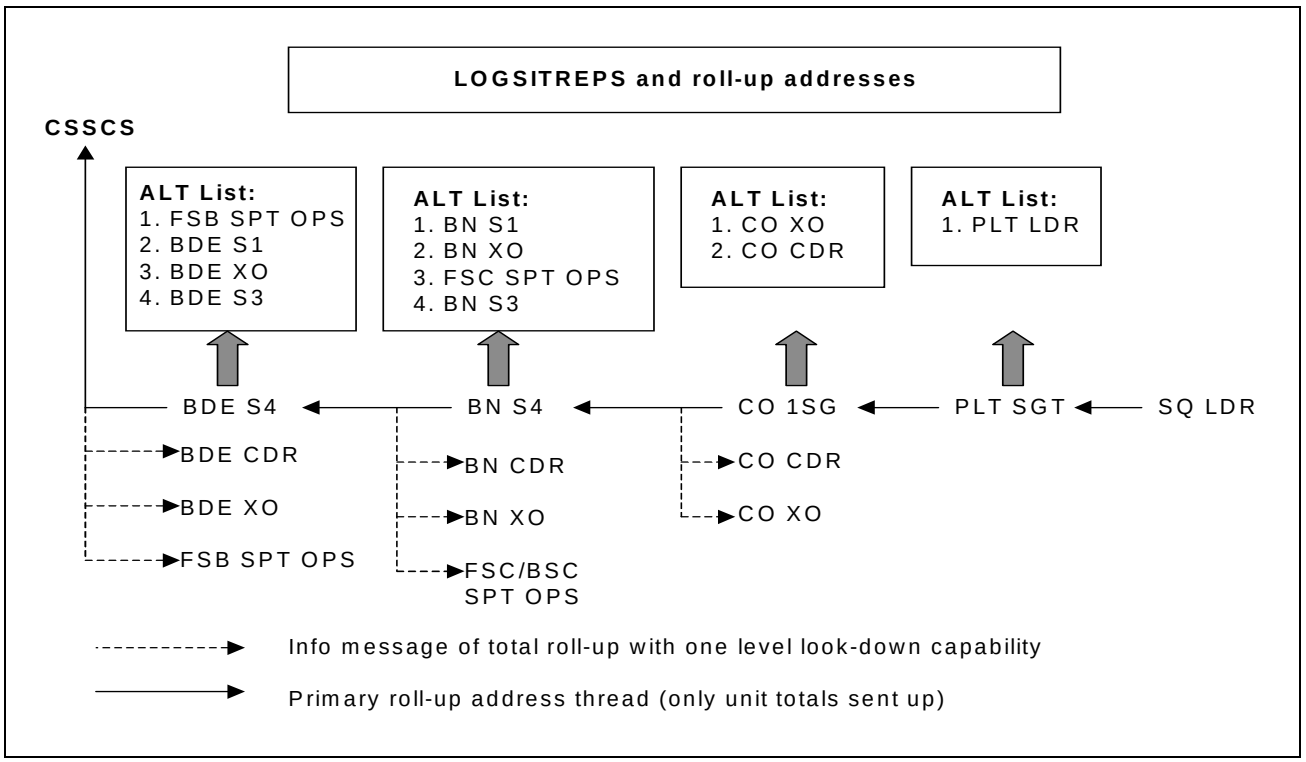

Figure 6-1d. LOGSITREP digital report flow

tlefield, a combat multiplier. The LOGSITREP is used to report on-hand quantities of classes of supply.

The CFS is entered as a templated message and is transmitted, per unit SOP, to the supporting logistics organization providing the service or support. The FBCB2 system hosts six categories of logistics CFS requests:

- Supply (includes the handling of Classes I, II, III, IV, and IX; laundry/bath service; and mortuary affairs).
- Transportation (includes pick-up service, delivery service, and information distribution).
- Maintenance (includes repair of equipment, recovery services, other maintenance services, and information distribution).
- Medical (includes personnel evacuations, medical support, distribution of Class VIII supplies, and information distribution).
- Religious (includes worship services, pastoral care, enemy prisoner of war (EPW)/refugee support, funeral services, memorial services, and information distribution).
- Other (this category is a catch all that allows flexibility for actions that are not covered within the other five categories).

LOGISTICS TASK ORDER

Once the appropriate CSS activity receives the CFS, the CSS manager identifies the most appropriate CSS resource to execute the mission. The CSS manager (tasking authority) sends a logistics task order (LTO) to the resource. This message is the same template as the CFS message; therefore, the requesting unit and its location are specified in the order. Once the CSS resource receives the message, the FBCB2 will prompt him to return an acknowledgment (ACK) message stating whether he will comply (WILCO), cannot comply (CANTCO), or have complied (HAVECO) with the message. If the resource replies with a WILCO, he will also be prompted to send an ACK of idle or active. This action specifies whether the resource is actively executing the mission or is working on another mission. Once the acknowledgment has been transmitted, the resource will conduct synchronization with the requesting unit by sending a free-text message stating acknowledgment and mission understanding.

CSS OVERLAYS AND ICONS

The FBCB2 operator can gain SA by activating the overlay feature of the FBCB2. The CSS overlay depicts the various CSS assets in the BCT sector. The overlay has icons depicting CSS assets such as supply points, CSS CPs, and LRPs. These points are posted to the CSS overlay by the BCT S4. Supply points send their locations to the BCT S4 with an information copy to the FSB support operations cell via free-text message for posting or updating the CSS overlay. This feature significantly assists the engineer company in locating key CSS supply activities during supply-point distribution and also assists the CSS units in locating the engineers when conducting unit distribution.

The FBCB2 operator can pick up visibility of CSS assets operating within the BCT's AO. These units will automatically transmit position reports that update each FBCB2 screen within the UTO. These updates are frequent and will maintain near-real-time position awareness. This feature allows the engineer company visibility of key CSS locations with the FBCB2. For example, if an ACE needs recovery, it will submit a CFS through the PSG and the 1SG. The CFS messaging will task a recovery vehicle (M88) to recover the vehicle. If the M88 is FBCB2 equipped, the message will identify the platform that requested recovery. During the synchronization process, the M88 will send a free-text message to the engineer 1SG stating that it

will conduct the recovery mission and will coordinate the most appropriate time to conduct the recovery mission. The M88 will then identify and select the ACE's icon on the SA map on the screen. The ACE can do likewise to observe the supporting M88 as it approaches the ACE. This feature prevents any confusion in locating the ACE and significantly increases the tempo of CSS support on the battlefield.

CSS NEAR-REAL-TIME MESSAGING

CSS reports such as the LOGSITREP and the CFS reports provide near-real time data that informs the company commander of the current logistics situation. The currency of the data facilitates early identification of supported elements' CSS requirements.

CSS COMMAND AND CONTROL

The ESE from the BSC will include a C^2 cell and an HHC maintenance section that will reside with the ALOC in the ESA. The ESE will "zip into" the ALOC to form a multifunctional, support-oriented CP (like various units zip into a tank battalion TOC to form a multifunctional TF TOC).

The ESE has three CRTs consisting of about eight mechanics, a contact truck, an APT, a 5-ton truck, and an M88. Each CRT will be collocated with the engineer company to provide it immediate forward repairs. The CRT will work for the engineer company's 1SG although its higher headquarters is the ESE.

When an engineer company remains task-organized to its parent engineer battalion or when it is under OPCON, DS, or GS to a maneuver TF, its supporting CSS team (fuel, transport, mess, and maintenance) will operate out of the ESA under the ESE. Calls for support will be passed from points in the engineer company through the company 1SG to the battalion S4 to the ESE. This does not prevent engineer companies from using maneuver UMCPs or other CSS assets to obtain immediate, good neighbor support. The brigade OPORD may also dictate certain deviations in CSS (for example, TF 1-2 will provide fuel support to A/99 Engineer). The engineer company supply sergeant will locate in the ESA.

When an engineer company is attached to a maneuver TF, a multifunctional CSS team (CRT plus other maintenance, PLL, transport, fuel, and mess) will be packaged and task-organized to that maneuver TF's forward support company. Calls for support will then be routed to the TF S4, not the engineer battalion S4. Engineer vehicles will be repaired in the TF's UMCP. The engineer company supply sergeant will locate in the supported unit's TF support area.

The company commander is responsible for integrating CSS into the engineer company. During combat, the XO, the 1SG, and the A&O platoon leader assist the commander with his CSS responsibilities. The XO is the logistics planner and coordinator. During the preparation of the TF order, he anticipates special logistical requirements of the engineer company (for example, extra POL assets for extended fighting-position construction or MICLIC reloads for complex obstacle reduction) and requests these assets from the battalion/TF (depending on the command/support relationship). See FM 71-2 for more information on TF CSS assets and operations.

The XO coordinates with the 1SG to determine what CSS the engineer company requires and ensures that arrangements are made for CSS to support the tactical plan. The XO—

- Determines the general location for the company resupply point.
- Receives periodic maintenance updates from the platoon leaders and sergeants,

the 1SG, and the maintenance-team chief.

The 1SG is the engineer company's CSS operator. He executes the company's logistical plan and directly supervises and controls the company trains. He receives CSS reports from the PSGs, provides information to the XO, and helps the XO complete CSS preparations and plan and conduct CSS operations. He can be assisted by the A&O platoon, depending on the tactical situation. The 1SG—

- Receives, consolidates, and forwards all administrative, personnel, and casualty reports to the battalion/TF combat trains.
- Directs the MEDEVAC section and company maintenance support team (MST) forward when the situation requires.
- Establishes and organizes the company resupply point.

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- Meets logistics packages (LOGPACs) at the LRP, guides the LOGPAC to the company resupply point, and supervises resupply operations.
- Orients new personnel to the company and assigns them to platoons.
- Supervises the acquisition, treatment, and evacuation of casualties.
- Supervises the evacuation of enemy prisoners of war (EPWs) and damaged equipment.
- Maintains a personnel roster for the company.
- Attends the CSS rehearsal as the company representative.

The supply sergeant is the engineer company's representative in the battalion field trains. He assists in the assembly of the company LOGPAC and moves it forward to the LRP under the control of the engineer support platoon leader. The supply sergeant follows the 1SG to the company resupply point and assists the 1SG with LOGPAC supervision. The supply sergeant also—

- Requests Class II, IV, VII, and IX items.
- Coordinates with the battalion/TF support platoon leader for Class I, III, and V supplies.
- Maintains individual supply and clothing records.
- Picks up personnel replacements at the engineer battalion field trains and in-processes them into the company.
- Receives and evacuates killed in actions (KIAs) to the graves registration point in the BSA.
- Returns the LOGPAC with EPW and damaged vehicles to the ESA for further disposition.

The CRT chief of the ESE—

- Organizes and supervises the CRT by—
  - — Conducting battle damage assessment and repair (BDAR) procedures.
  - — Performing mission-essential maintenance-only procedures.
- Advises the XO, the 1SG, and platoon leaders on vehicle recovery, repair, and destruction.
- Ensures that requests for repair parts are prepared and forwarded to the battalion/TF UMCP.
- Distributes repairs when they are received.
- Supervises exchange and cannibalization when that authority is delegated to him.
- Coordinates with the platoon sergeants for maintenance status' of their platoons (if not already provided by the 1SG).
- Takes responsibility for recovery operations to the UMCP or other designated maintenance collection points.

The medical team is assigned to HHC but attached to the company. They—

- Supervise the triage of the wounded and ill (both friendly and enemy).
- Advise the commander on the command's health.
- Evacuate seriously wounded personnel under the direction of the 1SG.
- Provide emergency medical treatment and stabilize injured soldiers for evacuation.
- Control, issue, and request resupply of Class VIII supplies, including nerve-agent antidote injectors.
- Train soldiers and combat lifesavers in first-aid procedures.

- Take responsibility for the medical evacuation-team operations.
- Advise the chain of command on field sanitation measures.

The ESE leader assigned to the BSC is the battalion CSS executor. He focuses on CSS operations forward, operating from the ESA. He—

- Provides all classes of supply, food service, and tactical field maintenance to the engineer battalion.
- Serves as the officer in charge (OIC) of the battalion UMCP.
- Controls maintenance support and establishes maintenance guidelines for the maintenance section.
- Shifts assets of his engineer CRTs to respond to the workload.
- Coordinates efforts with the HHC commander, the engineer battalion XO, the base support commander, and the brigade support operations officer.

COMPANY TRAINS

During combat, the company normally operates with the maintenance and medical teams forward (company combat trains). The remaining CSS assets operate from the TF or engineer battalion combat trains, the UMCP, or the field trains in the BSA. The 1SG is responsible for all of the company trains, but he normally supervises the combat trains if the company is so organized. The supply sergeant is the 1SG's principal assistant and supervises the company's CSS assets that are located in the TF or engineer battalion field trains.

The company trains normally operate between 500 to 1,000 meters (547 to 1,094 yards) (or one terrain feature) behind the engineer company. This allows the 1SG to provide immediate recovery, combat health support, and maintenance support to the company. During defensive missions, the engineer company is typically working across the TF's sector. The 1SG should attempt to locate the company trains where they can best support the platoons as they prepare the barrier and fortification plan.

During battle, the 1SG continually monitors the company command net and sends combat health and maintenance support forward to the platoons. He must have an armored vehicle (wheeled or tracked) with compatible communications to control the company combat trains effectively. He keeps the TF and engineer battalion combat trains command posts (CTCPs) informed on a continuing basis on the engineer company's logistics status.

SUPPLY FUNCTION

The supply sergeant is responsible for obtaining and delivering supplies to the engineer company. He delivers small items and depends on the support platoon to deliver large or frequently expended items (for example, complete Class V unit basic-load replenishment). The company commander, in his estimate of the situation, will set priorities for supply delivery. The company XO will develop the logistics plan, but the combat mission requirements will generally dictate Classes I, III, and V supplies as critical to successful operations. The supply sergeant will also receive and distribute mail as part of the LOGPAC. Generally, he will deliver the incoming mail to the 1SG and return outgoing mail to the field trains.

Class I items are rations and health, morale, and welfare items. Meals, ready-to-eat (MRE) are kept on each company vehicle in a basic load (normally three to five days). MRE and water are delivered daily to the company from the field trains by the supply section. Hot

meals should be served whenever the tactical situation allows. Water is delivered in the company water trailer brought forward by the supply sergeant. Water is more critical than food and must be delivered daily. Rations are automatically requisitioned and issued to the engineer company by the S4 based on the previous day's strength reports submitted to the S1. (The command/support relationship determines whether the engineer or the TF CTCP will receive these reports.)

Class II items include clothing, individual equipment, tentage, tools, and administrative equipment and supplies. These items are requisitioned through the S4 based on requirements from the company supply sergeant. The supply sergeant receives these supplies from the field trains and transports them forward with the LOGPAC.

Class III items include POL. Class III bulk products are delivered with each LOGPAC from the battalion support platoon. The company refuels its vehicles and equipment daily as a minimum. If the engineer company has a fuel tanker attached, it will return to the Class III supply point in the BSA to refuel after the company refuels. During extensive defensive preparations, the company will require additional mission loads of Class III for support fortification construction.

The company normally keeps a basic load of Class III package products (hydraulic fluid, motor oil, and vehicle lubrication) stored on each combat and tactical vehicle. Package products are replenished as they are used from stockage brought forward daily with the fuel tanker during LOGPAC distribution.

Class IV items include construction materials. Combat units normally carry small, basic loads of Class IV materials such as overhead cover material (sandbags and lumber) and concertina wire for individual fighting positions and protective-obstacle construction.

The Class IV/V (barrier material and mines) items for extensive defensive preparations will normally be pushed forward by division or corps transportation assets to a maneuver brigade or TF-controlled supply point. This supply point is managed by the maneuver unit with engineer representation.

Class V items include ammunition. Class V material is based on reported ammunition expenditures submitted to the field trains by the 1SG. The engineer company's ammunition is delivered daily with the LOGPAC. Special-purpose ammunition can be prepositioned or delivered as part of the company LOGPAC or separately to a predetermined site, depending on the mission (MICLIC reloads for the offense or mines for defensive preparations).

Class VI items include personal-demand items available through the post exchange. These items are requested through the S1 by the 1SG.

Class VII items include major end items. These items are requisitioned through the S4. Crews are assigned and the replacement combat vehicles normally come forward with the LOGPAC. Engineer-specific equipment replacement is normally received through the engineer battalion regardless of the command/support relationship.

Class VIII items include medical supplies. These items are provided by the TF's or engineer battalion's medical platoon, depending on the command/support relationship. Requests for medical supplies to replenish aid bags for the company medics and combat lifesavers are submitted to the TF's aid station by the company senior aidman.

Class IX items include repair parts and documents for equipment maintenance. Repair parts are requested through the prescribed load list (PLL) clerk. They are delivered with LOGPAC or picked up by the MST at the UMCP.

RESUPPLY OPERATIONS

A LOGPAC is a resupply element based on the requirements of the company. The engineer company LOGPAC is a mixture of BSC assets (maintenance, forward-repair, supply and transportation, and engineer support platoons) that transport supplies to the companies (see Figure 6-1d for composition of a FXXI company LOGPAC).

A LOGPAC normally consists of a POL truck; an ammunition truck (Class IV/V items); and a supply truck that carries rations, water, mail, repair parts, and other requested items and pulls a water trailer. LOGPACs are—

- Assembled in either the BSA or ESA, then led by the supply sergeant with a TF or

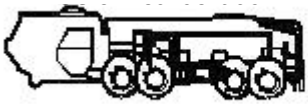
PERSONNEL	VEHICLE
Supply sergeant	Engineer-owned supply truck (supplies and rations) and water trailer 
Driver	BSC-owned parts truck and trailer 
Driver	BSC-owned ammo truck 
Driver	BSC-owned fuel truck 
NOTE: LOGPAC may be larger or smaller, based on METT-T.	

Figure 6-1d. FXXI company LOGPAC

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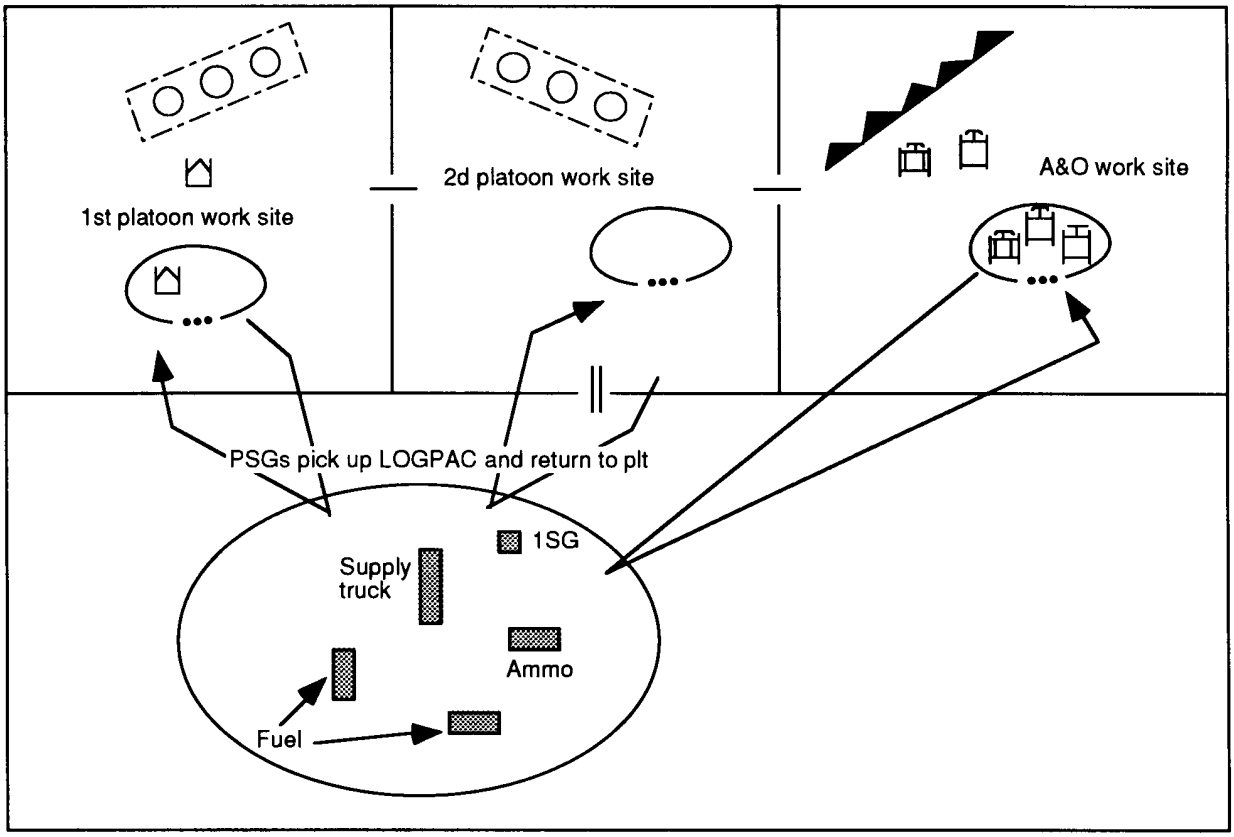
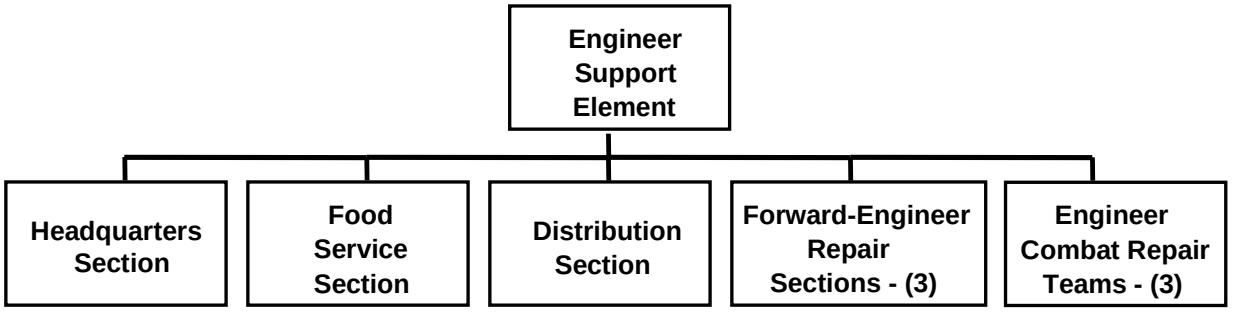


Figure 6-3. Modified-tailgate LOGPAC

evacuation. The combat medic is assisted by the combat lifesaver. Generally, there is one combat lifesaver per squad or section. The combat lifesaver is a nonmedical soldier who has received enhanced first-aid training. The medical team supervises the forward acquisition, treatment, and evacuation of the wounded to the TF or nearest battalion aid station. When numerous casualties are anticipated, patient-collecting points are established to facilitate patient acquisition. The 1SG dispatches the armored ambulance to meet and receive patients being transported by nonmedical vehicles. The 1SG arranges for additional evacuation assets when the number of seriously wounded soldiers exceeds the evacuation capability of the company medical team. Less seriously wounded soldiers can be transported by nonmedical transportation assets to the nearest aid station. Weapons and military equipment are generally not evacuated with the wounded. However, the wounded keep their mission-oriented protective posture (MOPP) gear and personal items.

MAINTENANCE

FXXI tactical and garrison maintenance is the BSC's responsibility and is performed by the operators and engineer CRT mechanics of the BSC. Engineer line companies receive maintenance support from CRT mechanics assigned to the ESE of the BSC. The HHC receives maintenance support from the HHC maintenance section of the ESE. The ESE has three CRTs consisting of about eight mechanics, a contact truck, an APT, a 5-ton truck, and an M88 (see Figure 6-4, page 6-8). Each CRT will always be collocated with the engineer company to provide it immediate, forward repairs. The CRT will work for the engineer company 1SG, though its higher headquarters is the ESE.



Engineer Support Element Major Equipment

Headquarters	
HMMWV	Command and control, communications and mobility

Food Service Section	
2 1/2-ton truck	Supporting the food service section's requirement to feed assigned/attached personnel

Distribution Section	
HMMWV	Tactical mobility for the section leader
HEMMT cargo trk – (3)	Movement of other classes of supply and equipment
HEMMT fuel trk, 2500 gal - (6)	Prime mover for bulk POL

3 – Forward-Engineer Repair Section (Total)	
HMMWV - (4)	Tactical mobility for maint tech and section
Truck cargo: LTV - (3)	Transports major assemblies and section equipment
Truck cargo: MTV - (3)	Transports major assemblies and section equipment

3 – Engineer Combat Repair Teams (Total)	
Recovery vehicle, M88A2 – (3)	On-site recovery asset
Contact truck – (3)	On-site contact maintenance
HMMWV – (3)	Tactical mobility for maintenance team
Truck cargo: MTV – (3)	Transports major assemblies and teams equipment
Heavy contact maintenance truck: PLS mounted (HCMTP) – (3)	Provides on-site DS maintenance capabilities

Engineer Support Element Personnel

Headquarters			
Logistics Officer	03	90A00	1
Engr Equip Maint NCO	E7	62B40	1
Operations Sergeant	E7	88M40	1
Pwr-Gen Equip Rep	E5	52D20	1
Equip Rec/Parts SGT	E5	92A20	2
LT Wheeled Veh Mech	E4	63B10	1
Recovery Veh Operator	E4	63S10	1
Track Veh Mech	E4	63Y10	1
Equip Rec/Parts Spec	E4	92A10	2
Pwr-Gen Equip Rep	E3	52D10	1

Food Service Section			
Senior Food Opns SGT	E7	92G40	1
Senior First Cook	E6	92G30	1
Cook	E5	92G20	1
Cook	E4	92G10	3
Cook	E3	92G10	3

Distribution Section			
Pet Veh Supv	E6	77F30	1
Pet Hvy Veh Op	E5	77F20	2
Pet Hvy Veh Op	E4	77F10	4
Vehicle Driver	E4	88M10	2
Vehicle Driver	E3	88M10	1

3 – Forward-Engineer Repair Sections (Total)			
Engr Rep Tech	W3	919A0	1
Section Chief	E7	63H40	1
Track Veh Rep	E5	63H20	3
Welder	E4	4B10	3
Lt Wheeled Veh Mechanic	E4	63B10	3
M1 Tank Auto Mech	E4	63E10	3
Wheeled Veh Rep	E4	63W10	3
Track Veh Mech	E4	63Y10	3
Track Veh Rep	E3	63H10	3

3 – Engineer Combat Repair Teams (Total)			
M1 Tank Maint Supv	E7	3E40	3
Const Equip Rep	E5	62B20	3
Recovery Veh Op	E5	63H20	1
Recovery Veh Op	E5	63Y20	2
Track Veh Mech	E5	63Y20	3
Const Equip Rep	E4	62B10	3
M1 Tank Auto Mech	E4	63E10	3
Recovery Veh Op	E4	63H10	1
Recovery Veh Op	E4	63Y10	2
Track Veh Mech	E4	63Y10	3

Figure 6-4. Engineer support element organization (personnel and equipment)

When an engineer company remains task-organized to its parent engineer battalion, or when it is under OPCON, DS, or GS to a maneuver TF, its supporting CSS team (fuel, transport, mess, and maintenance) will operate out of the ESA under the ESE. Calls for support will be passed from points in the engineer company through the company 1SG to the battalion S4, then to the ESE. This does not prevent engineer companies from using maneuver UMCPs or other CSS assets to obtain immediate, good neighbor support. The brigade OPORD may also dictate certain deviations in CSS (for example, TF 1-2 will provide fuel support to A/99 Engr). The engineer company supply sergeant will locate in the ESA.

When an engineer company is attached to a maneuver TF, a multifunctional CSS team (CRT plus other maintenance, PLL, transport, fuel, and mess) will be packaged and task-organized to that maneuver TF's forward support company. Calls for support will then be routed to the TF S4, not the engineer battalion S4. Engineer vehicles will be repaired in the TF UMCP. The engineer company supply sergeant will locate in the supported unit's TF support area.

Doctrinally, recovery is the owning unit's responsibility. This becomes virtually impossible for the engineer vehicles working in the TF's area. In the defense, the TF provides recovery support at least back to the UMCP located near the combat trains. If repairs cannot be made at the UMCP and the time and situation permit, the engineer's maintenance team can come forward and recover the disabled vehicle. The engineer battalion should provide further recovery back to the brigade forward support area (BFSA) for repairs, coordinating with the BSC for recovery assets. The engineer BMO or technician must ensure that each BFSA has DS mechanics capable of repairing engineer equipment.

In the offense, the TF recovers the vehicle to the MSR. Depending on the situation, the TF either turns the vehicle's recovery over to the engineers or the vehicle is picked up by recovery assets from the BSC. It must be clear in the TF's SOP or OPORD which maintenance team has recovery responsibility for the engineer vehicles. The priority that the TF commander places on the engineer assets determines in what priority they are recovered.

The engineer company's maintenance contact team routinely visits work sites. The communications repairman and armorer accompanies this maintenance team to help anticipate problems and provide support before the mission is jeopardized.

Maintenance starts with preventive maintenance by the vehicle's operator and crew and continues through repair by mechanics. It is a continuous process. The engineer operators must be able to perform preventive maintenance on their equipment at any time and in any situation. This is especially important given the lower densities and higher maintenance levels of specialized engineer equipment.

Maintenance and recovery are initiated by the vehicle's operator and crew. They identify the problem through preventive maintenance. Faults are annotated on DA Form 2404 and submitted to the 1SG daily during distribution before receiving rations. If the MST chief is present during distribution, the DA Form 2404s are submitted to him. Typically, the Unit-Level Logistics System (ULLS) clerk will be forward to support the company. Normally, he will be integrated with the TF UMCP. Maintenance and repair requiring the MST should be performed as far forward as possible.

After the crew identifies a fault, they report to the PLT LDR and PSG the status of the fault, the location of the vehicle, and the circumstances of the fault. The crew and the chain of command make an estimate to determine the maintenance support requirements (self-recovery, fix forward, assistance from nearby vehicles or units, or assistance from the battalion).

If the repairs needed are beyond the crew's ability, the platoon notifies the 1SG. He then

notifies and dispatches the MST to the vehicle. If the repair takes longer than two hours, the 1SG requests additional support from the BMO.

If the vehicle cannot be fixed forward, it is evacuated to the TF or engineer battalion UMCP. If the engineer company is attached, the TF attempts to fix the vehicle. If the repair is beyond the TF's capability, the engineer battalion dispatches recovery assets forward to either repair the vehicle in the TF's UMCP or further evacuates the vehicle to the BSA (this is normally required if special tools or parts are required for the equipment).

The PLT LDR or PSG in a FXXI unit will report the vehicle's exact location, the vehicle type, and the extent of damage using FBCB2 to the BSC through the 1SG. The crew should remain with the vehicle to assist in evacuation and repair, to provide security, and to return the repaired vehicle to the platoon as soon as possible.

If the vehicle is unrepairable or cannot be recovered, personal items, radios, crew-served weapons, ammunition, and other serviceable items and parts are removed. The automotive and remaining weapons systems

physically cease to exist as an engineer organization and will become infantry.

EMPLOYMENT CONSIDERATIONS

According to FM 5-100, the TF commander, unless otherwise prohibited, has the authority to reorganize the engineer company as infantry if engineers are in a command relationship with the TF. Normally, this authority is retained by division and corps commanders. In his decision, he must carefully weigh the gain in infantry strength against the loss of engineer support. The engineer company provides him far more combat power in its primary configuration than as infantry. Stopping the engineer work may reduce the combat power of his entire force. Because of the long-term impact, the commander employing an engineer unit as infantry has the responsibility to notify the next higher headquarters of his action.

The decision to employ an engineer unit as infantry is made by the commander after careful analysis considering both demands for infantry and for engineers. An immediate requirement for infantry does not require reorganization—the engineers are simply committed to the fight. Maintaining unit integrity is an important consideration. Engineer soldiers should never be used as individual infantry replacements but committed as reorganized infantry units (such as platoons or companies). Reorganization takes place when there is adequate time to move unnecessary engineer elements and equipment from the battle area and to augment the engineer structure with additional capabilities. The commander normally considers reorganizing when he forecasts a shortage of infantry before a future operation or phase of an operation. The decision is taken after weighing METT-T factors and determining an acceptable level of risk. Available time to prepare is critical. Normally, the situation is extremely urgent when engineers must be converted to infantry; consequently, time to reorganize completely is rarely available.

REORGANIZATION CONSIDERATIONS

The commander must consider several important factors before he converts the engineer company to infantry. These include the—

- Situation's urgency.
- Result of losing engineer support.
- Reaction time required.
- Engineer combat capability or potential to fight as infantry.
- Engineer training level.
- Engineer mission, if committed as infantry.
- Engineer support requirements of the force after the commitment of the engineers as infantry.
- C^2 of engineer assets not committed as infantry.
- CS assets the engineer company will need for their infantry mission (such as FIST-V, ambulances, air defense, and so forth).

Engineer companies are generally task-organized throughout the division area and are normally integrated with battalions/TFs. Engineers in combat vehicles or dismounted formations fight as required under the formation commander's command. Engineers preparing defenses fight from those positions with the defenders, if attacked. The engineers retain the ability to use their close-combat skills as infantry in unforeseen emergencies.

The commander directing this employment should provide early warning to allow the unit time to assemble, reorganize, and prepare before commitment. The engineer company must provide immediate liaison to the gaining maneuver command to facilitate planning and integration. This generally requires about 24 hours to accomplish, unless the unit has previously prepared for a similar mission.

When the engineer company is employed as infantry, one major consideration for the commander is the disposition of major items of engineer equipment such as ACEs, AVLBs/ Wolverines, and SEEs. Equipment not used in the infantry role may be attached to other units for C^2 purposes or to accomplish other engineer tasks. This is METT-T driven and is generally based on the overall concept of the operation.

The commander directing the employment should augment the engineer company unit with air-defense and fire-support teams. The unit should also be augmented with heavy AT weapons and additional medical personnel, if available.

Table 7-1. Highlights of the engineer combat power in the FXXI environment

FXXI Capabilities	
Organization	Company • 2 combat platoons • 1 A&O platoon Platoon • 4 ESVs • 2 dismounted squads
Equipment	Grizzly • Shock factor • M1 armor protection • Creates 4.2 meter lane through simple and complex obstacles • Increased SA with FBCB2 Wolverine • Reduces 24 meter gap in five minutes • MLC 70 capability • Increased SA with FBCB2
Munitions	Volcano Hornet-PIP • Unmanned terrain dominance • Provide flexibility to maneuver • Shock effect
Enhanced C4I systems	FBCB2 • Combat power of TF maintained by increased SA of obstacles

FXXI ENGINEER COMBAT POWER

The FXXI combat engineer company consists of two line platoons and an A&O platoon, although advanced SA and system technologies enable the platoons to operate with a reduced number of dismounted soldiers. The combat engineer platoon (mechanized) consists of four engineer squad vehicles with two dismounted squads. The development of a new ESV like the Bradley will significantly contribute to the TF's combat power. The vehicle provides increased operating tempo (OPTEMPO), self-protection, and suppression capabilities for the engineers.

The Grizzly (when fielded) will provide a significant shock factor to the TF maneuver ele-

ments. The Grizzly's mine-clearing blade, power-driven arm, and M1 armor protection, make it very effective in obstacle reduction during a combined-arms breach.

Hornet PIP munitions will enable the engineers to project combat power and gain unmanned terrain dominance. Engineers can employ Hornet munitions as situational obstacles or in an economy-of-force role in unmanned terrain where the commander is willing to take a tactical risk. This frees maneuver units to focus on the main effort. The on/off capability of the Hornet munitions will give the maneuver commander the flexibility and freedom to maneuver decisively on the battlefield. Hornet PIP top-attack munitions will have a significant shock effect on the enemy and impact his ability to maneuver.

Engineers maintain the combat power of the TF by using their FBCB2 to graphically update obstacle locations and provide SA to prevent fratricide.

ORGANIC COMBAT POWER

Commanders with the authority to direct the employment of engineers as infantry must be aware of differences in combat power between engineer and infantry units. Engineer units provide the following:

- Combat-engineer platoon (mechanized). Organized as mechanized infantry, the platoon consists of four APCs, carrying a headquarters and three rifle squads. Each squad has a squad leader, a carrier team, and a dismount team.
- Combat-engineer company (mechanized). The forward elements of a reorganized engineer company consist of the company headquarters, two rifle platoons, and the A&O platoon. Engineer equipment not needed for the infantry mission will be further task-organized to support the maneuver mission or reorganized with the engineer battalion. The A&O platoon is not equipped to be mechanized infantry, but can be used to augment the other two platoons or as dismounted infantry. The CEVs should remain forward with the company; they provide a significant fire-power advantage to the company.

UNIT CAPABILITIES

Engineer units employed as infantry do not have the same capabilities as conventional infantry units. At the squad and platoon levels, engineers normally operate in organizations similar to infantry and have the same basic small-arms weapons. However, the mechanized-infantry platoon is equipped with the M2 Bradley fighting vehicle and has a marked advantage over the APC-equipped engineer platoon.

The engineer company can effectively control other arms as a company/team because it normally works closely with them. The company is best suited by training for defensive operations. To be fully effective, the engineer company needs heavy AT weapons augmentation and the normal CS provided to any infantry unit.

The most likely requirement for reorganizing engineers into infantry results when the force's reserve has been committed and it is necessary to reconstitute the reserve. As a reserve, the engineer company can be used to reinforce TF units in contact or as a blocking force to stop enemy penetration or counterattack. They can best accomplish this by building and occupying a strongpoint. Other uses include—

- Augmenting an armored battalion with infantry to build a TF.
- Augmenting an infantry battalion with an additional infantry company.
- Operating separately in an economy-of-force role or as a part of a brigade defense.
- Providing air-assault forces for seizing critical terrain.
- Replacing reconnaissance forces or scout platoons within the TF.

The above list can also be accomplished while fighting as engineers. Given today's unit organization, converting engineers to infantry is undesirable and formal reorganization is likely to be time-consuming.

Table A-13. War-gaming techniques

Technique	Description
Avenue in depth	This technique concentrates on one AA from start to finish. It is equally applicable to offensive and defensive operations. It allows the engineer to war-game the analyzed impact of enemy obstacles on the attack plan and the effects of sequential obstacle belts or groups for the defensive plan.
Belt	The belt technique divides the battlefield into areas that run the width of the sector, war-gaming across the front and multiple avenues at once. This is the preferred technique. It allows the engineer to war-game the mutual support between obstacle belts and groups. It is the best method for analyzing mutual support and adjacent engineer support.
Box	This technique focuses solely on critical enemy or friendly events in a designated area (box). The advantage of this method is that it is not time-consuming. It allows the engineer to focus on a particular breaching site or EA.

RECOMMEND A COURSE OF ACTION

The objective of the comparison is to make a unified recommendation to the commander on which COA is best. The engineer may have to give greater consideration to a COA that he can least support if it looks like it is the best selection from the other staff perspectives. He must be prepared to inform the maneuver commander where risk must be accepted or what additional assets he will need to avoid that risk. The engineer must also be prepared to inform the maneuver commander where those assets may be obtained and what influence the commander may have to exert to get them. This is where knowledge of the higher and adjacent unit's engineer assets becomes important.

Based on the staff's recommendations, the commander makes a decision on which COA to adopt for final planning. He may select a specific COA, modify a COA, or combine parts of several COAs. In any event, the commander decides and issues to the staff additional guidance for developing the plan. This guidance concentrates on synchronizing the fight, focusing on integrating the TF combat support into the plan.

FINALIZE THE ENGINEER PLAN AND ISSUE ORDERS

The engineer focuses his planning efforts on the SOEO for the selected maneuver COA. The engineer determines the C^2 necessary to accomplish the engineer missions (see Chapter 2 for additional information). The SOEO is fine-tuned based on the war-gaming process, commander's guidance, and situation updates. As the engineer fills in the details of his plan, he refers back to his initial mission analysis to ensure that all missions have been taken into account. He ensures that all engineer tasks are assigned to maneuver and engineer units as part of the subunit instructions. He makes final coordination with other staff members to ensure total integration and mutual support.

The engineer conveys his written plan through his input in the basic OPORD (SOEO, subunit instructions, and coordinating instructions paragraphs) and the engineer annex (see Appendix B). As part of the combined-arms staff, the engineer also participates in the OPORD brief to the assembled command group. As with the other primary staff officers, the engineer gets only one chance to brief the command group on

the SOEO. This is the first step in a properly executed and well-coordinated engineer plan.

The engineer's focus is to brief the subordinate commanders; the maneuver commander and staff should already know the plan. Time is always critical; repeating information covered by other staff members should be avoided, and only critical items should be covered (including SOP items). Above all, the engineer should be thoroughly familiar with the total plan so that he is comfortable fielding questions.

USE DIGITAL TOOLS TO ENHANCE THE ENGINEER ESTIMATE

Table A-14 shows the digital enhancements to the engineer estimate. The engineer estimate may be expedited and sequential steps need not be followed since many actions can be performed independently or simultaneously based on an ability to share large amounts of information, conduct analysis, and subsequently fuse the data into relevant information. However, engineers must learn how to leverage their digital systems and develop the associated TTP that enable engineer planning, battle-space visualization, and mission execution.

Table A-14. Digital enhancements to the engineer estimate

Engineer Estimate	Digital Enhancements
Receive the mission (FBCB2)	• Planning cycle starts earlier • Parallel planning at brigade, battalion, TF, and company levels
Conduct the IPB/EBA (FBCB2) (DTSS, ASAS-RWS, MCS-ENG)	• Automated digital terrain and enemy analysis • Overlay production enhanced • Enhanced vertical and horizontal dissemination (near-real time) • Current and up-to-date information to support planning
Analyze the engineer mission (FBCB2)	• Current and up-to-date information to support planning
Develop the SOEO (FBCB2)	• Simultaneous, vertical, and horizontal issuance • Better understanding of commander's intent
War-game and refine the engineer plan (FBCB2)	• Digital wargaming • Fewer COAs required due to SA
Recommend a COA (FBCB2)	• Digital visualization of the COAs and the battlefield
Finalize the engineer plan	
Issue orders (FBCB2)	• Simultaneous, vertical, and horizontal issuance

Many of the information voids that feed facts and assumptions are filled through digital linkages established with national, strategic, and tactical databases. This information is shared vertically and horizontally among the staff and subordinate maneuver elements of the division. The engineer battalion will then digitally transmit the information to the engineer company.

In addition, current enemy information, both textual and imagery, will be fed from the brigade ASAS-RWS database and DTSS databases to assist the TF engineer and XO in their engineer threat analysis.

The TF engineer or XO is able to provide graphic detail using the automated tools found in the FBCB2 related to each COA. This information may be electronically shared with all staff elements via free-text messages and file transfer. The information provided describes in detail the who, what, how, when, and where of engineer support provided to the TF and its subordinate maneuver units. This exchange of information provides a venue for cross talk between the TF BOS and supported elements. It enhances planning, problem identification, and problem resolution related to the supporter or supported.

NOTE: FXXI forces, based on their ability to acquire large amounts of information early in the estimating process, may be able to develop a single, supportable COA in a relatively short period of time.

APPENDIX D

ENGINEER COMPANY WORKING SEPARATE FROM ENGINEER BATTALION

Certain circumstances can cause the detachment of one or more companies for an extended period of time (when the company is with a deploying TF, with a TF attached to another brigade, or used to augment another engineer battalion [light or heavy]). This type of task organization is often found during contingency operations.

PLANNING

The company will be supported with a service-support slice from the engineer battalion headquarters company. The normal command relationship for the support slice is attached to the engineer company. This slice should be tailored to support the type of operation that the company participates in. At a minimum, it should include the personnel and equipment listed in Table D-1.

The engineer company must have the capability to stand alone under these circumstances. During contingency operations, the engineer company could be called on to support any number of operations. These include constructing refugee camps and EPW compounds, performing humanitarian missions, destroying captured enemy equipment, clearing areas of UXO, developing combat roads and trails, and constructing base camps to support follow-on contingency forces.

The engineer company could also have additional attachments based on its mission requirements. These include, but are not limited to—

- Infantry or armored platoons for security.
- Vertical or horizontal construction elements.
- Water-purification units.
- Military police (MP) sections.
- EOD units.

Table D-1. Support personnel and equipment

Maintenance	POL	Combat Health Support	Mess
1 maintenance NCOIC 6 mechanics 1 PLL clerk 1 M88 1 contact truck 1 ULLS computer PLL to support OPTEMPO	1 fuel handler 1 HEMMT fuel truck	1 senior aidman with evacuation team 1 ambulance	1 senior cook with mess team 1 vehicle with MKT or KcLFF

These forces could also be coalition multinational forces in contingency operations. The engineer commander must ensure that he has the capability to support these varied units to achieve his mission. In many cases, the company may also be augmented by civil-affairs personnel and military translators to facilitate operations in the AO. When conducting operations with non-FXXI friendly or multinational forces, the FXXI unit is responsible for providing SA (situation and location data). SOPs must be developed to address the procedures for operations with non-FXXI forces.

PREPARATION

For extended operations, the company is normally attached to the supported TF. The TF commander has to fully integrate the engineer company into all planning sessions, rehearsals, and administrative actions. After attachment, the engineer company commander ensures that the gaining TF commander understands the capabilities, limitations, and requirements associated with the engineer company. The engineer commander and the TF commander coordinate the linkup point, linkup time, and the size of the force (personnel and equipment) being transferred.

EXECUTION

The detached company is responsible for maintaining communications with the engineer battalion, where possible. The company reports equipment, personnel, and mission status according to unit SOPs. Although the engineer battalion commander has no tasking, command authority, or OPCON over the detached company, he must anticipate reattachment and be prepared to refit or rearm the company as needed.

APPENDIX E

BASIC FORMATIONS AND MOVEMENT TECHNIQUES

The company uses a variety of mounted and dismounted formations and movement techniques to maneuver on the battlefield. This appendix gives examples of many of the basic formations and movement techniques the company commander could use. It is not designed to be all encompassing. For more information on these topics, see FMs 7-8, 5-34, and 71-1.

Basic formations and movement techniques are simplified in the FXXI battalion/TF through the use of precision lightweight GPS receivers (PLGRs) and digital C4I systems. These systems enhance dispersion, all-around security, speed, and overwatch. The FBCB2 facilitates maneuver, without loss of control, where terrain permits. Information can be sent via the FBCB2 in various reports or in SA automatic positioning updates to simultaneously update maneuver commanders and platoons on changes to the tactical situation.

During the execution of offensive operations, the commander may elect to restrict the use of automated tactical reporting to maintain his force and to periodically check his digital display unit (DDU) to maintain digital SA. If actions on contact occur faster than the commander can effectively control via FBCB2, he should revert to voice communications.

MOUNTED MOVEMENT TECHNIQUES

The mounted engineer company must be proficient in moving with its maneuver counterpart. In the following paragraphs, formations, movement techniques, and actions taken during movement for the mounted engineer company are discussed.

WEDGE

The engineer company almost always maneuvers as part of another larger formation. Normally, this will either be the parent engineer battalion or TF. Figure E-1, page E-2, shows the formation that the company is most likely to use. The company wedge provides the most defensible formation with the easiest C^2. Ordinarily, the company follows a maneuver company. The company might lead if it is part of the engineer battalion formation. In either case, the wedge is the best formation to use if enemy contact is likely.

The company will also have organic, and possibly task-organized, support equipment. These could include the ACE, Grizzly, or tank or infantry platoons from other companies/teams. These additional vehicles can strain the company's C^2 capability. All of the heavy support vehicles are tethered to individual engineer platoons. Each platoon leader has the responsibility of assisting with the C^2 of a heavy equipment asset. This improves the company's C^2 and provides each heavy asset with a security element as it moves across the battlefield. Any vehicles that are not METT-T required to complete a mission will fall under the control of the engineer company XO/1SG.

Figure E-2, page E-3, shows a company wedge formation. Note where the key leaders in the company are. While the platoon sergeant is forward, his M998 should move with the engineer company XO/1SG but be prepared to move forward to support changing mission requirements.

COLUMN

Figure E-3, page E-4, depicts a column formation. This formation is used when enemy contact in not expected. This formation

maximizes C^2 and the speed of the formation. Normally, the company transitions from the column to the wedge as enemy contact becomes more likely.

LINE

Figure E-4, page E-4, shows the company in a line formation. This formation is designed to maximize the company's forward firepower. The company transitions from the wedge to the line as enemy contact becomes eminent. Engineer companies do not generally use this formation. However, if the company is tasked to suppress a dismounted

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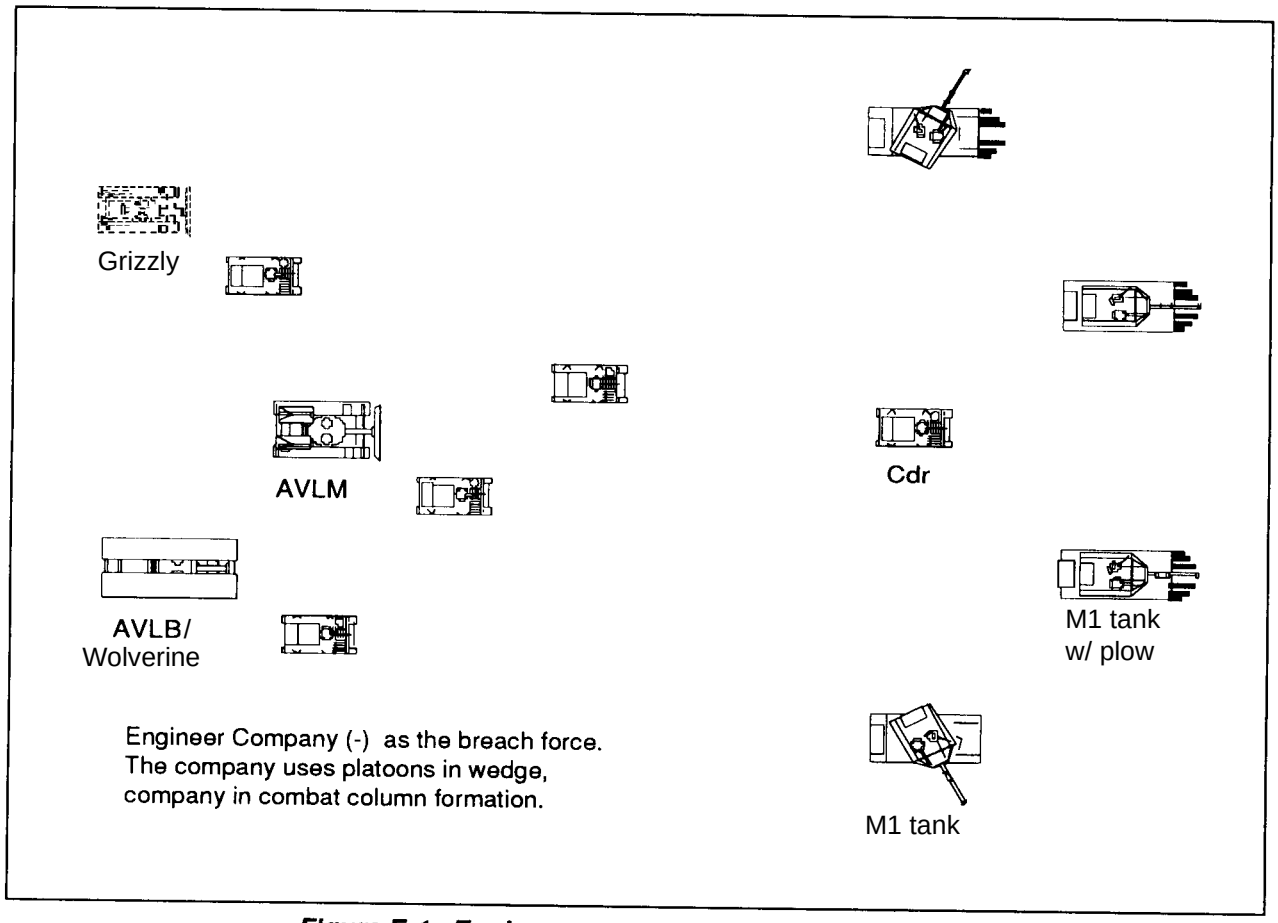

Figure E-1. Engineer company (-) as the breaching force

threat while another company maneuvers, this formation works well.

ECHELON

The echelon formation is used when the company is on the flank of the battalion/TF and the enemy threat is also from the flank. Figure E-5, page E-5, shows an echelon right formation. The echelon formation can also be used on the left flank of the battalion and, in that case, it would be the mirror image of Figure E-5. This formation maximizes the company's firepower to the flank.

V

The V formation is a variation of the wedge. It is used when there is a significant threat of command-detonated mines or explosives. The formation shown in Figure E-6, page E-6, could be used during a route-clearance operation. It allows the company to secure the flanks of the road while a platoon clears the route. This formation also identifies command-detonated-mine firing wires or ambushes before the enemy can attack the element on the route. It is not generally used when there is a significant enemy threat.

DISMOUNTED MOVEMENT TECHNIQUES

The dismounted engineer company must be proficient in moving with its maneuver counterpart. In the following paragraphs, formations, movement techniques, and actions taken during movement for the dismounted engineer company are discussed.

APPENDIX G

TACTICAL COMMUNICATIONS

The SOP plays a critical role in ensuring that company communications enhance SA and contribute to mission accomplishment. They prescribe hand-and-arm and flag signals that can aid in company movement and clear, concise radio transmissions that help reduce transmission times. On FXXI FBCB2-equipped vehicles, tank commanders (TCs) can monitor their display unit (DU) with its standardized graphics and preformatted reports. This significantly reduces the need to send voice updates of friendly vehicle positions and other routine reports using FM voice.

RADIO

The radio is the company's most flexible, frequently used, and reliably secure means of communications. It can quickly transmit secure voice and digital information over long distances with great accuracy. Secure equipment and the ability of the SINCGARS SIP to frequency-hop provide the company with communications security against most enemy direction-finding, interception, and jamming capabilities. However, sophisticated direction-finding equipment can trace almost any radio signal; the transmitter then can easily be destroyed. Survival of the engineer company depends on good communications habits, especially when using the radio; leaders must strictly enforce radio discipline. The most effective way to use the radio is to follow standard radiotelephone procedures (RTP), including brevity, and the proper use of authentication tables and approved operational terms.

NOTE: When FXXI units establish contact with the enemy, reporting via digital means may become too cumbersome. Units should have an SOP that addresses communication procedures after enemy contact has been established. For example, the SOP should designate who at each command echelon will monitor FM-voice traffic and in turn prepare/transmit required digital reports to higher headquarters. Digital reports must be sent to higher headquarters so that a common picture of the battlefield is generated and subsequently shared among all the command's FBCB2 systems. This will free the company commander and his PLT LDRs to fight the battle while reporting battle events by the most expeditious means possible (such as FM voice).

DIGITAL COMMUNICATIONS

FBCB2 enables the FXXI units to receive and transmit digitally encoded information through the SINCGARS SIP and enhanced position location reporting system (EPLRS) very-high-speed integrated circuits (VHSIC) radios to other similarly equipped vehicles. A digital link is established when one radio is able to transmit and receive digital information to or from another. When properly linked, the commander is continuously updated with position location information from the company's vehicles' position/navigation (POS/NAV) and FBCB2 interface. Position servers, predefined according to UTO and usually EPLRS VHSIC equipped, broadcast individual platform positions onto the EPLRS need line for dissemination throughout the net.

NOTE: Care must be taken to ensure that a common set of values is used when setting FBCB2 vehicle filter (time) settings. These time settings, when set by the FBCB2 operator, represent the

elapsed time when the FBCB2 system on a vehicle will automatically update the position of that vehicle and send this information to other FBCB2 systems of a specific UTO network. Therefore, battalion, company, and platoon SOPs must clearly define what these time settings will be for each operation. Unless the setting is standardized throughout all command elements, position/location data generated will become suspect, SA lost, and fratricide potential increased.

TACTICAL INTERNET

The tactical internet (TI) is the term for both the physical communications network that provides the general-purpose data backbone and also the overall concept of an integrated battle-space automated infrastructure. The TI is named as such because of the wide and intentional similarities to the commercial internet.

Designed as the primary communications architecture supporting the FXXI warfighter at brigade and below, the network allows sharing of C^2 data by users which results in near-real-time SA and thereby improves force C^2. The TI is designed to electronically link all users so critical C^2 and SA information is available to make tactical decisions. Planners and operators communicating within the TI must understand their particular role and that of their operational platform. Turning off radios, FBCB2, or improper initialization of equipment will impact the overall functionality of the TI. Operating within the TI carries with it an increased operator responsibility to ensure that proper start-up and sustainment procedures are accomplished and a fundamental understanding of how the TI functions.

The SINCGARS SIP radio is responsible for sending and receiving voice, SA, and C^2 data for those platforms not equipped with EPLRS VHSIC radios. Interfacing with a PLGR and FBCB2 computer, SA information is broadcast to all SINCGARS SIP net members and the SA data is displayed on FBCB2 screens. The internet controller (INC) interprets the information from the FBCB2 and SINCGARS SIP and sends new position data to the nearest EPLRS VHSIC local-area SA server and then to the carrier sense multiple access (CSMA) need line, thereby updating all members of a particular net.

Key TI communication systems being employed are described in the following paragraphs.

SINCGARS-SIP

The SINCGARS SIP is designed to provide voice- and data-communications capability and is employed in C^2 and combat platforms at all levels. It is the primary path for data transmission at the company, platoon, and squad/team levels. The SINCGARS SIP features a global positioning system (GPS) device interface and embedded GPS reporting in all voice and enhanced-data-mode (EDM) data messages to provide reporting of friendly force position in support of SA. The SINCGARS SIP uses the INC to provide packet radio relay nodes across the battlefield for horizontal and vertical integration of C^2 data.

EPLRS VHSIC

The EPLRS VHSIC radio set (AN/VSQ-2 [V]) is a state-of-the-art LOS data-only radio system. It serves as a position location, navigation, and communications system. It is employed in the combat platforms of the commander, XO, 1SG, PLT LDRs, and PSGs at the company and platoon levels. It is the primary data communications link between battalion C^2 platforms and company/platoon combat platforms. The primary components are the Network Control Station (NCS) and the radio set (RS). The average distance between radios is 3 km to 10 km depending on power-out settings and terrain. The EPLRS VHSIC can be employed in retrans

platforms and configured to provide retransmission capability.

The FBCB2 system's architecture uses EPLRS VHSIC to provide wide-area-network (WAN) connectivity across the SINCGARS SIP network from platoon to brigade levels. **NOTE: Vehicles equipped with EPLRS VHSIC or FBCB2 with PLGRS will provide an electronic signature each time an automatic update is provided or a vehicle position report is sent.**

FORCE XXI FBCB2

The FBCB2 is a battlefield, battle-command information support system supported by existing and emerging communications, sensors, and computers. The FBCB2 is both a system and a concept to be used by combat, CS, and CSS units across all BOS disciplines while performing operations at the tactical level. FBCB2 includes both embedded battle-command software and FBCB2 tactical computers.

FBCB2 computing hardware are a mix of commercial, ruggedized, and militarized computers; system software; installation kits; application software; and integrated logistics support installed in vehicles and issued to individual soldiers. FBCB2 provides SA and C^2 capabilities to all TF echelons through several input devices such as GPS, BCIS, SINCGARS SIP, and EPLRS VHSIC.

POSITION/NAVIGATION DEVICE (PND)

The PND is designed to support vehicles not equipped with one of the other FBCB2 devices. The PND has a functional GPS card internal to the computer rather than relying on an external PLGR GPS receiver. The PND has a colorized liquid crystal display (LCD) with internal display measuring 7 inches diagonally. It has a touch-screen capability allowing the soldier to select soft push buttons from the FBCB2 display screen with a finger or with a stylus.

PRECISION LIGHTWEIGHT GLOBAL POSITION RECEIVER

This is a hand-held, self-contained, multi-channel receiver capable of receiving the precise positioning signal (PPS) and tracking up to five satellites. It operates on battery or external power. It provides position coordinates, time, and velocity information. It can be operated hand-held or can be vehicular-, aircraft-, or facility-mounted.

DIGITAL TRAFFIC

In the FXXI units, digital traffic may precede, replace, or follow voice transmissions. Do not duplicate digital traffic with voice messages. However, because digital systems are not totally matured, it may be necessary to verify/ confirm the receipt of critical digital traffic. The sender can transmit an acknowledgment message that will require the receiver or receiver's system to acknowledge receipt of the digital message or report. To avoid possible digital/voice contention, a code word at company/platoon level, sent by FM voice, should precede a digital transmission to warn other members of the company/platoon that a digital message is being sent. Figure G-1, page G-4, highlights FXXI company FM voice/digital network and equipment.

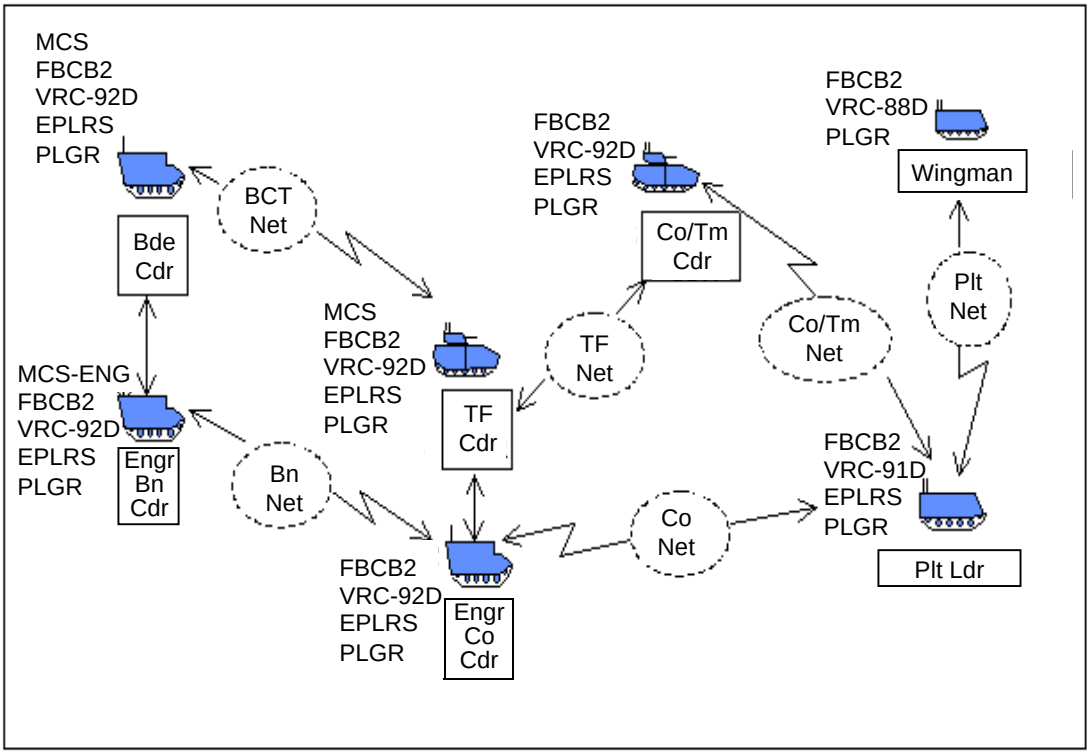

Figure G-1. Company FM voice/digital network and equipment

GLOSSARY

1SG	first sergeant
2IC	second in command
A&L	administrative and logistical
A&O	assault and obstacle
AA	avenue of approach
ABCS	Army Battle Command System
ABF	attack by fire
ACE	armored combat earthmover, M9
ACK	acknowledge
ADA	air-defense artillery
ADAM	area denial artillery munition
admin	administration
ADO	air-defense artillery officer
AHD	antihandling device
AIDSV	agility, initiative, depth, synchronization, and versatility
ALOC	Administrative Logistics Operations Center
ALT	alternate
AMB	air-mission brief
ammo	ammunition
AO	area of operations
AP	antipersonnel
APC	armored personnel carrier
AR	armor
ARNG	Army National Guard
ASAP	as soon as possible
ASAS	All-Source Analysis System
ASAS-RWS	All-Source Analysis System—Remote Work Station
AT	antitank
atk	attack

attn	attention
AVLB	armored vehicle-launched bridge
AVLM	armored vehicle-launched MICLIC
AXP	ambulance exchange point
B	bulk
B/P	be prepared
BC	battle command
BCIS	Battlefield Combat Identification System
BCT	brigade combat team
BDAR	battle damage assessment and repair
bde	brigade
BESV	Bradley engineer squad vehicle
BFA	battlefield functional area
BFSA	brigade forward support area
BICC	Battlefield Information Control Center
bii	basic issue items
BIT	built-in-test
BMO	battalion maintenance officer
BMP	an amphibious infantry combat vehicle
bn	battalion
BOS	battlefield operating system
BP	battle position
BSA	brigade support area
BSC	base support company
BSO	battalion signal officer
C^2	command and control
C4I	command, control, communications, computers, and intelligence
can.	canister
CANTCO	cannot comply
cas	casualty
CASEVAC	casualty evacuation

CATK	counterattack
cbt	combat
CCIR	commander's critical information requirements
CCP	casualty collection point
cdr	commander
CEV	combat-engineer vehicle
CFS	call for support
CGO	cargo
cgy	center of gravity
CHS	combat health support
CL	class
CLS	combat life savers
cmd	command
CO	commanding officer
co	company
co/tm	company/team
COA	course of action
commo	communications
comp	composition
COMSEC	communications security
const	construction
cont	continue, continued, contain
coord	coordinating
CP	command post
CRT	combat repair team
CS	call sign
CS	combat support
CSE	combat support equipment
CSMA	carrier sense multiple access
CSOP	combat security observation post
CSR	control supply rate

CSS	combat service support
CSSCS	Combat Service Support Control System
CTCP	combat trains command post
DA	Department of the Army
DDU	driver's display unit
Dec	December
decon	decontamination
def	defense
dir	direction
DIS	defense in sector
dist	distribution
distro	distribution
DIV	division
DP	decision point
DPICM	dual-purpose, improved conventional munitions
DS	direct support
DSVT	digital secure voice terminal
DTG	date-time group
DTSS	Digital Topographic Support System
DU	display unit
ea	each
EA	engagement area
EAD	echelons above division
EBA	engineer battlefield assessment
ech	echelon
EDM	enhanced data mode
EMT	emergency medical treatment
engr	engineer
EOD	explosive ordnance disposal
EPLRS	enhanced position location reporting system
EPW	enemy prisoner of war

equip	equipment
ESA	engineer support area
ESE	engineer support element
est	establish
ESV	engineer squad vehicle
evac	evacuation
FA	field artillery
FAC	forward air controller
FAS	forward aid station
FASCAM	family of scatterable mines
FBCB2	Force XXI Battle Command – Brigade and Below
FEBA	forward edge of the battle area
FIST	fire-support team
FIST-V	fire-support team vehicle
FIT	fault-isolation test
FLA	front-line ambulance
fld	field
FM	field manual
FM	frequency-modulated
FO	forward observer
FPOL	forward passage of lines
FRAGO	fragmentary order
freq	frequency
FSB	forward support battalion
FSE	fire-support element
FSO	fire-support officer
ft	foot, feet
FWD	forward
FXXI	Force XXI
gal	gallon
GEMSS	ground-emplaced mine scattering system

gen	generator
GP	group
GPS	global positioning system
Grizzly	heavy force complex obstacle breacher
GS	general support
GSE	ground support equipment
GSR	ground surveillance radar
HAVECO	have complied
HCMTP	heavy contact maintenance truck – PLS mounted
HEMTT	heavy expanded mobility tactical truck
HHC	headquarters and headquarters company
HMMWV	high-mobility, multipurpose wheeled vehicle
HN	host nation
Hornet PIP	Antitank/antivehicular off-route top attack munition
HQ	headquarters
hr	hour (s)
HVT	high-value target
HVY	heavy
IAW	in accordance with
ID	identification
INC	internet controller
info	information
intel	intelligence
INTSUM	intelligence summary
IPB	intelligence preparation of the battlefield
JTF	joint task force
KIA	killed in action
km	kilometer(s)
L/U	linkup
LCD	liquid crystal display
LD	line of departure

ldr	leader
LMTV	light medium tactical vehicle
LO	liaison officer
LOC	lines of communication
loc	location
LOGPAC	logistics package
LOGSITREP	logistics situation report
LOS	line of sight
LRP	logistics release point
LRU	line replacement unit
LT	light
LTO	logistics task order
LTV	light tactical vehicle
M/S	mobility/survivability
m	meter(s)
maint	maintenance
MAS	main aid station
MBA	main battle area
MC	mobility corridor
MCOO	modified combined obstacle overlay
MCS	Maneuver Control System
MCS-ENG	Maneuver Control System-Engineer
mech	mechanized, mechanic
med	medical
MEDEVAC	medical evacuation
METL	mission-essential task list
METT-T	mission, enemy, terrain, troops, and time available
METT-TC	mission, enemy, terrain, troops, time available, and civilians
MF	minefield
MI	military intelligence
MICLIC	mine-clearing line charge

MKT	mobile-kitchen trailer
mm	millimeter(s)
MOPMS	modular pack mine system
MOPP	mission-oriented protective posture
MOUT	military operations on urbanized terrain
MP	military police
MRB	motorized rifle battalion
MRC	motorized rifle company
MRE	meals, ready-to-eat
MRP	motorized rifle platoon
MRR	motorized rifle regiment
MRT	mortar
MSE	mobile subscriber equipment
MSR	main supply route
MST	maintenance support team
MTC	movement to contact
mtd	mounted
MTOE	modified tables of organization and equipment
MTV	medium tactical vehicle
N/A	not applicable
NAI	named area of interest
NBC	nuclear, biological, chemical
NCO	noncommissioned officer
NCOIC	noncommissioned officer in charge
NCS	network control station
NEO	noncombatant evacuation operation
NLT	not later than
no.	number
O/O	on order
Obj	objective
obst	obstacle

OBSTINTEL	obstacle intelligence
OCOKA	observations and fields of fire, cover and concealment, obstacles, key terrain, and avenues of approach
OEG	operational exposure guidance
OIC	officer in charge
OP	observation post
op	operator
OPCON	operation control
OPLAN	operations plan
opns	operations
OPORD	operation order
ops	operations
OPSEC	operations security
OPTEMPO	operating tempo
org	organize, organization
P	package
para	paragraph
PCC	precombat checks
PCI	precombat inspection
pers	personnel
PGM	precision-guided munitions
ph	phase
PIP	Product Improvement Program
PIR	priority intelligence requirements
PL	phase line
PLGR	precision lightweight GPS receiver
PLL	prescribed load list
plt	platoon
PLT LDR	platoon leader
PND	position navigation device
POC	point of contact

POL	petroleum, oil, and lubricants
POS/NAV	position/navigation
PP	passage point
PPS	precise positioning signal
prep	prepare, preparation
pri	priority
PSG	platoon sergeant
PSYOP	psychological operations
pt	point
pwr	power
qty	quantity
R&S	reconnaissance and surveillance
RAAMS	remote antiarmor mine system
RCP	relevant common picture
recon	reconnaissance
rep	repair
req	required
retrans	retransmission
ROE	rules of engagement
RP	release point
rpr	repair
rqr	required
RS	radio set
rte	route
RTP	radiotelephone procedures
/s/	signed
S1	Adjutant (US Army)
S2	Intelligence Officer (US Army)
S3	Operations and Training Officer (US Army)
S4	Supply Officer (US Army)
S&T	supply and transportation

SA	situational awareness
SAM	surface-to-air missile
SCATMINE	scatterable mine
SEAD	suppression of enemy air defenses
sec	section
SEE	small emplacement excavator
SGT	sergeant
SINCGARS	single-channel, ground-to-air radio system
SIP	System Improvement Program
SITEMP	situation template
SITREP	situation report
SME	subject-matter expert
SOEO	scheme of engineer operations
SOF	special operations forces
SOI	signal operating instructions
SOP	standing operating procedure
SOSR	suppress, obscure, secure, and reduce
SP	start point
spec	special, specialist
SPO	support operations office
SPOTREP	spot report
spt	support
sq	squad
ST	self test
STANAG	Standardization Agreement
STAT	status
sub	subordinate
sup	supply
supv	supervisor
surv	survivability
SVC	service

TAC CP	tactical command post
TACP	tactical air-control party
TAI	targeted area of interest
TC	tank commander
TDP	turret-down position
tech	technician
TF	task force
TFM	tactical field maintenance
TI	tactical internet
TLP	troop-leading procedure
tm	team
TM	technical manual
TOC	tactical operations center
TOE	table(s) of organization and equipment
trans	transportation
trk	truck
trl	trailer
trns	trains
TRP	target reference point
TTP	tactics, techniques, and procedures
UAV	unmanned aerial vehicle
ULLS	Unit-Level Logistics System
UMCP	unit maintenance collection point
UN	United Nations
US	United States of America
USAES	United States Army Engineer School
USAF	United States Air Force
USAR	United States Army Reserve
UTO	unit task organization
UXO	unexploded ordnance
veh	vehicle

VHSIC	very-high-speed integrated circuits
vic	vicinity
w/	with
WAN	wide-area network
whl	wheel
WILCO	will comply
WO	warning order
Wolverine	heavy forces armored assault bridge
XO	executive officer

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